GROUND-WATER RESOURCES

IN THE VICINITY OF WALLUM LAKE, RHODE ISLAND

RHODE ISLAND
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COORDINATING BOARD

GEOLOGICAL BULLETIN NO. 12

1961

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GROUND-WATER RESOURCES

In The Vicinity Of

Wallum Lake, Rhode Island

By

GLENN W. HAHN
Geologist, U. S. Geological Survey

RHODE ISLAND
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GROUND-WATER RESOURCES IN THE VICINITY OF WALLUM LAKE, RHODE ISLAND

By

GLENN W. HAHN

ABSTRACT

The major ground-water reservoirs of the Wallum Lake area, in the northwestern corner of Rhode Island, consist of relatively thick glacial deposits of outwash, which partly fill preglacial bedrock valleys. The deposits range widely in sorting, grain size, and permeability.

Quantities of water perennially available from the major ground-water reservoirs are estimated to be about 3,250 mg (million gallons) from the Nipmuc, Clear, Pascoag, and Chepachet River valleys; about 290 mg from the Wakefield Pond area; and about 500 mg from the Bowdish Reservoir-Keach Pond area. Quantities of ground water in storage, available for use during droughts, are estimated to be about 1,500 mg in the Nipmuc, Clear, Pascoag, and Chepachet River valleys; about 15 mg in the Wakefield Pond area; about 55 mg in the Bowdish Reservoir area; about 2 mg in the Keach Pond area; and about 31 mg at the south end of Pascoag Reservoir. Additional water, which could be induced by pumping to enter the ground-water reservoirs provided the bottoms of the ponds are composed of relatively permeable material, is stored in the ponds: about 220 mg in Wakefield Pond, about 250 mg in Bowish Reservoir, about 63 mg in Keach Pond, and about 720 mg in Pascoag Reservoir.

Large supplies of ground water, from 150 to 350 gpm (gallons per minute), can be developed in the ground-water reservoir underlying the Nipmuc, Clear, Pascoag, and Chepachet River valleys. Most promising sites are at the eastern border of the Wallum Lake area and along the Pascoag and Clear Rivers. Comparable supplies may be available near Sucker Pond, at the south end of Pascoag Reservoir, near Wakefield Pond, and near Bowdish Reservoir, but exploratory testing is necessary to confirm this. Minimum yields of ground water, even in the most promising areas, may be as low as a few gpm where the deposits include large amounts of very fine sand, silt, or clay.

INTRODUCTION

LOCATION OF AREA

The Wallum Lake area (pl. 1) is in the northwestern corner of Rhode Island between latitudes 41°54′33″ and 42°00′44″ N. and longitudes 71°38′45″ and 71°47′59″ W. (See fig. 1.) The area is in Providence County and includes parts of the towns of Burrillville and Glocester. Villages in the area include: Bridgeton, Chepachet, Echo Lake, Harrisville, Mapleville, Oakland, Pascoag, and Whipple.

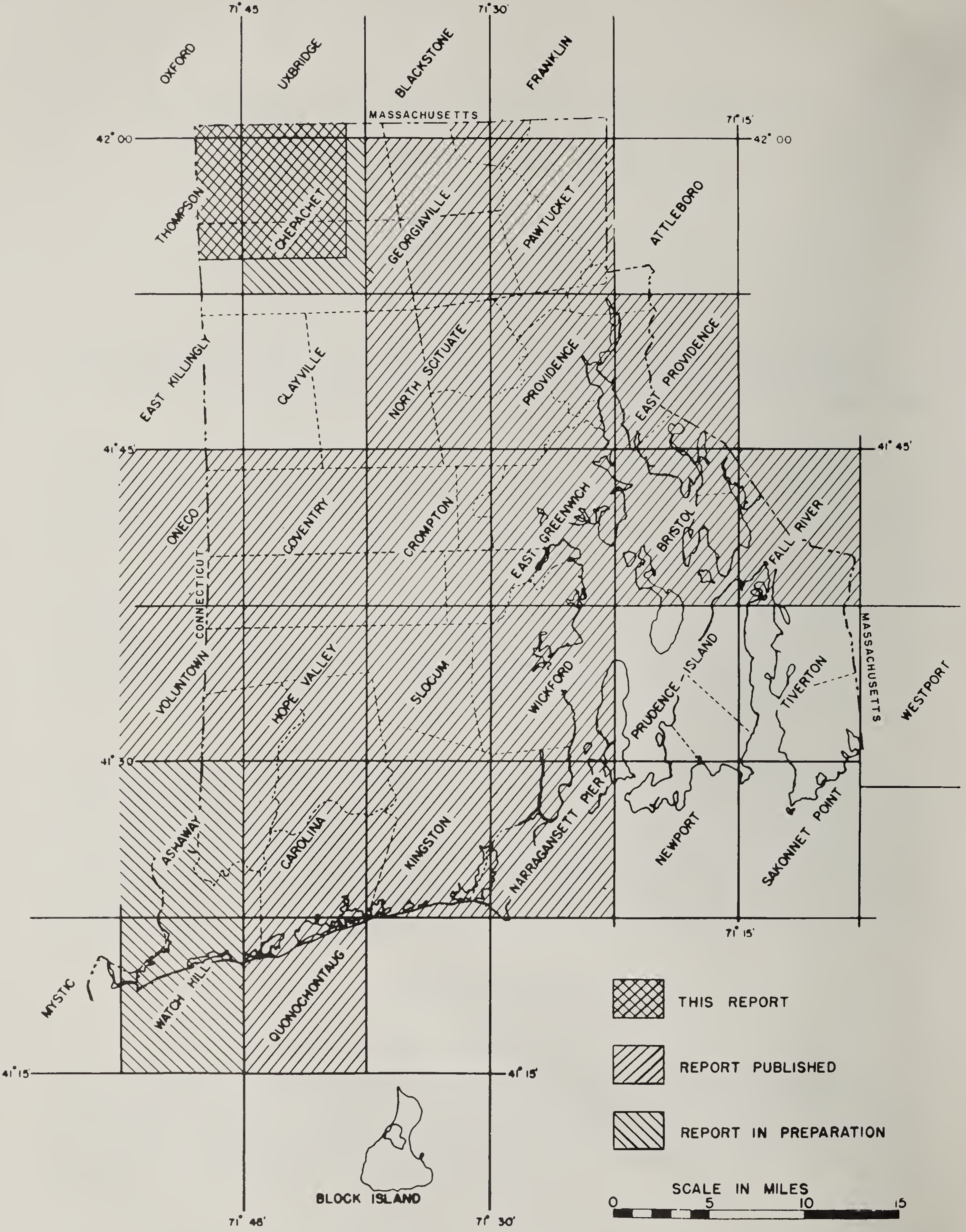

Figure 1--Index map of Rhode Island showing status of ground-water investigations in 1961

PURPOSE AND SCOPE OF INVESTIGATION

This report concludes the twelfth study in a program of continuing investigations of the ground-water resources of Rhode Island. The program was begun in September 1944 by the U. S. Geological Survey in cooperation with the Rhode Island Industrial Commission and was continued with other State agencies. Since 1957, the cooperation has been with the Rhode Island Water Resources Coordinating Board. The objectives of the program are to determine the areal extent and geologic nature of the principal ground-water reservoirs of Rhode Island and to collect and interpret hydrologic data on the occurrence, availability, and quality of ground water in these reservoirs. Reports or maps of 19 quadrangles have been published and 3 others are in preparation (fig. 1). The quadrangles partly covered in this study will be published in the ground-water map series. (See list of reports and maps, back cover.)

The purpose of this study is to furnish the basic geologic and hydrologic data needed by the State to develop a ground-water supply for the Zambarano State Hospital. The present water supply for the hospital is obtained from Wallum Lake. Minimum daily requirements are 250,000 gallons. The lake lies partly in Rhode Island and partly in Massachusetts. On the Massachusetts side bathing is allowed at a State park. Summer cottages are being built along the lake both in Massachusetts and Rhode Island. Because of the increasing danger of pollution of the lake water, the Rhode Island Water Resources Coordinating Board asked the Geological Survey to make an investigation of the possibility of developing a ground-water supply in an area in Rhode Island within a 5 mile radius of Wallum Lake. Work on this investigation began in October 1960.

For a better understanding of the geology and hydrology, the study area was expanded to include the 54 square mile area shown on plate 1. Included in the report are geologic and hydrologic data including records for 116 representative wells; lithologic logs for 17 wells; and chemical analyses of water from 5 wells, 1 river, and 3 ponds. Records for other wells in this and adjoining areas are on file in the office of the Ground Water Branch, U. S. Geological Survey, Providence, R. I.

PREVIOUS INVESTIGATIONS

A brief study to find ground water for the Zambarano State Hospital was made by W. B. Allen and L. Y. Marks in June 1955. No report was prepared or published. The study indicated it was not economically feasible to develop ground water for the following reasons:

(1) Wells penetrating the bedrock that underlies the area would yield about 20 gpm (gallons per minute) and nine or ten wells would be needed to get 250,000 gpd (gallons per day).

(2) Wells penetrating till which overlies bedrock throughout most of the area would be relatively unproductive; yields of more than 10 gpm being unlikely.

(3) The nearest outwash deposits capable of yielding significant quantities of water are 2 miles away — a distance too great to be considered a source of water supply at that time.

The latest report on the ground-water resources of Rhode Island was made by S. M. Lang (1961). A section of this report is devoted to a discussion of ground-water conditions in the upper part of the Branch River basin, which includes the Wallum Lake area.

WELL-NUMBERING SYSTEM

Each well in the Wallum Lake area has been assigned a number, there being a separate series for each town. Letters prefixed to the well number indicate the town name. Burrillville in indicated by "Bur." and Glocester by "Glo." These prefixes are used in the text, in figures 2 and 3, and in tables 5, 6, 7, and 8. They do not appear on plates 1 or 2, because the town names and boundaries are shown on plate 1.

PERSONNEL AND ACKNOWLEDGMENTS

The cooperative agreement between the U. S. Geological Survey and the State of Rhode Island and Providence Plantations is under the administrative direction of O. Milton Hackett, Chief, Ground Water Branch of the Federal Survey, and Walter J. Shea, Chairman, Rhode Island Water Resources Coordinating Board.

Appreciation is expressed for the assistance of officials of the Rhode Island Department of Health, well owners, well drillers, water-supply superintendents. Professor A. W. Quinn, Brown University, furnished information on the bedrock geology. The cooperation of the following agencies and companies that furnished hydrologic data used in the preparation of this report is gratefully acknowledged: Pascoag Fire District, Harrisville Fire District, A. & W. Artesian Well Co., and O. Spink Artesian Well Co.

PHYSIOGRAPHY

TOPOGRAPHY AND DRAINAGE

The Wallum Lake area is within the Upland section of the New England physiographic province (Fenneman, 1938, p. 358, 370). Most of the area is marked by round-topped hills, which are generally elongate along the northwest axis and which are separated and dissected by narrow, steep-walled valleys. In contrast to these, the valleys of the Nipmuc, Clear, Pascoag, and Chepachet Rivers are relatively broad and have terraced walls and generally some degree of floodplain development.

Major drainage is through the above mentioned valleys to the eastern border of the area, where the Pascoag and Chepachet Rivers merge to form the Branch River. Minor drainage is westward into Connecticut, through Robbins Brook, Wakefield Pond, Keach Pond, and the small ponds west of Bowdish Reservoir. Other minor drainage is east from Wallum Lake into Clear River (pl. 1).

CLIMATE

The climate of the Wallum Lake area is of the humid-continental type, but is moderated by the Atlantic Ocean. Weather observations are made for the U. S. Weather Bureau at Greenville, R. I. and at Putnam, Conn., about 14 miles southeast and 10 miles southwest, respectively, of Wallum Lake. Because these stations are outside the Wallum Lake area, an average of the data from them is probably most representative of climatic conditions in the area. Tables 1 and 2 list average monthly and annual precipitation for the period 1946 through 1960 and average monthly and annual mean temperatures for the period 1948 through 1960 from these stations.

The annual precipitation in the area averages 48 inches and is relatively evenly distributed throughout the year. The wettest months are generally March, April, and November, but occasional hurricanes or violent storms in August within recent years have raised that month's average precipitation. The driest months are generally February, June, and July. (See table 1.)

The mean annual temperature in the Wallum Lake area averages 48.9°F. January and February are the coldest months and July and August are the warmest. (See table 2.)

GEOLOGY

STRATIGRAPHY

Stratigraphic units distinguished in the vicinity of Wallum Lake are, from oldest to youngest: (1) highly metamorphosed sedimentary rocks intruded by igneous rocks, both of pre-Pennsylvanian age; (2) glacial deposits of Pleistocene age; and (3) deposits of Recent age, which overlie the glacial deposits locally.

The pre-Pennsylvanian rocks are reported to be diorite, gneiss, and quartzite,[1] but the water-bearing capacities of the various rocks are not significantly different. Hence no attempt is made to differentiate rock types in this report; they are considered together as consolidated bedrock, and their lithology is not discussed in detail.

The glacial deposits are unconsolidated and of two general types: till and outwash. Till is an unstratified, poorly-sorted, heterogeneous mixture of boulder to granule gravel, sand, silt, and clay deposited directly by glaciers. Till generally mantles the buried bedrock surface and is exposed over about 80 percent of the area. Outwash is defined as including all types of stratified glacial drift. In this area it is a more or less well-sorted material deposited by meltwater streams or in small, transitory lakes near the ice. It forms deposits as thick as 125 feet in the major river valleys. Most of the outwash in the vicinity of Wallum Lake was deposited by water directly on or against bodies of stagnant ice in the form of kame terraces, kames, and ice channel fillings. (See Flint, 1957, p. 146-159.) These forms are not distniguished on plate 1 and are discussed only in general terms as they pertain to the occurrence of ground water. Coarse, well-sorted deposits of satuated outwash are the most promising sources of ground-water supply.

Deposits of Recent age include alluvium and swamp deposits. They are also unconsolidated, but are relatively thin and less extensive in comparison to the glacial deposits. The alluvium occurs most extensively in the floodplains of the Nipmuc, Clear, Pascoag, and Chepachet Rivers. Although not determined, its thickness is probably less than 20 feet. Swamp deposits are surficial features, generally less than 5 feet thick. Where the Recent deposits occur, they have been mapped together with the underlying till or outwash on plate 1 and are discussed as parts of those units.

The geologic units of the Wallum Lake area are summarized in table 3.

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[1] Personal communications, Professor A. W. Quinn, Brown University, Providence, Rhode Island.

Table 1.-- Average of monthly and annual precipitation, in inches, at Greenville, R. I. and Putnam, Conn. (From publications of the U. S. Weather Bureau).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Annual
1946	2.98	2.58	1.76	2.36	5.70	3.70	3.03	10.00	3.32	0.54	1.62	3.56	41.15
1947	2.78	1.91	2.90	5.08	4.17	4.30	4.14	2.74	5.32	2.64	6.04	3.14	45.16
1948	5.14	1.72	4.12	4.34	8.36	4.74	5.04	2.53	1.63	3.98	7.26	2.73	51.59
1949	4.11	2.74	2.84	3.48	4.76	.24	1.00	4.32	5.06	2.47	3.39	2.72	37.13
1950	3.98	4.04	3.90	4.43	4.01	3.40	2.78	6.74	2.38	2.11	8.43	4.37	50.57
1951	3.62	5.02	5.78	4.26	5.45	3.04	3.80	5.40	2.27	3.96	9.69	5.24	57.53
1952	4.79	2.69	4.90	4.84	3.98	5.59	1.44	6.88	2.89	2.54	2.82	3.52	46.88
1953	6.76	4.16	9.38	5.90	4.34	1.48	3.70	2.57	1.91	5.38	5.90	5.55	57.03
1954	2.44	2.89	4.02	5.31	4.62	2.82	3.17	7.70	7.94	3.30	4.76	5.68	54.65
1955	.70	4.48	3.74	2.88	1.32	4.48	2.91	14.02	4.14	9.68	5.14	.81	54.30
1956	4.28	4.04	5.64	3.21	2.54	2.50	3.92	1.39	5.43	2.32	4.32	4.80	44.39
1957	2.30	1.79	2.78	4.57	1.77	1.48	.44	1.56	1.72	2.59	4.88	7.20	33.08
1958	7.13	2.26	3.07	6.93	3.63	1.94	4.93	3.88	6.04	3.64	3.54	1.56	48.55
1959	2.86	3.52	5.94	4.37	1.46	5.06	6.86	3.44	.76	7.74	5.90	4.60	52.51
1960	3.64	4.64	3.62	3.28	2.10	1.46	7.22	2.48	6.12	3.64	3.54	3.51	45.25
Average	3.83	3.23	4.29	4.35	3.88	3.08	3.62	5.04	3.80	3.77	5.15	3.93	47.98

Table 2. -- Average of monthly and annual mean temperatures, in degrees F, at Greenville, R. I. and Putnam, Conn. (From publications of the U. S. Weather Bureau).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average Annual
1948	19.8	23.4	36.4	46.5	55.2	63.1	71.2	70.6	62.8	50.5	45.9	32.2	48.1
1949	32.9	32.6	37.4	48.6	57.8	68.7	75.5	71.8	60.3	55.4	39.8	31.8	51.0
1950	34.6	25.9	31.7	44.2	55.1	65.2	70.7	68.0	58.6	53.2	44.4	32.2	48.6
1951	30.1	31.8	37.4	48.6	57.2	64.4	71.0	68.7	62.4	53.0	38.7	32.0	49.6
1952	31.3	31.6	36.0	48.6	54.0	66.7	73.6	69.5	62.6	48.8	41.0	32.7	49.7
1953	32.1	33.3	38.2	47.4	58.6	67.6	70.2	68.6	62.9	52.9	44.0	36.1	51.0
1954	23.8	34.7	37.0	48.4	54.6	65.6	68.8	65.8	59.6	55.6	40.9	31.0	48.8
1955	25.4	29.8	35.4	47.6	60.1	64.0	74.5	71.5	60.8	52.4	38.9	22.8	48.6
1956	27.8	30.0	30.6	42.5	53.0	67.0	68.4	68.8	57.8	51.2	41.4	32.9	47.6
1957	19.5	31.6	37.0	48.4	57.5	69.7	71.0	66.6	62.8	50.2	43.2	35.2	49.4
1958	30.9	21.0	36.2	47.0	53.6	61.0	70.4	68.8	61.3	49.7	42.4	22.2	47.0
1959	25.8	23.6	34.1	48.3	60.1	64.0	71.9	72.0	64.6	52.0	41.0	31.9	49.1
1960	26.5	32.2	29.1	47.8	58.0	65.8	68.3	68.4	60.4	49.6	42.4	24.7	47.8
Average	27.7	29.3	32.5	47.2	56.5	65.6	71.2	69.2	61.3	51.9	41.8	30.6	48.9

Table 3.—Geologic units in the Wallum Lake area and their water-bearing properties.

Age: Period	Age: Epoch	Geologic units	Material	Water-bearing properties
Quaternary	Recent	Flood-plain and swamp deposits. (0-20 ft. thick)	Deposits of boulders, sand, silt, and decayed organic matter.	Not known to be tapped by wells. Thin and discontinuous, hence would not yield large supplies.
	Pleistocene	Outwash (0-125 ft. thick)	Unconsolidated stratified sand and gravel and gravel interbedded with minor amounts of fine sand, silt, and clay. Thickest in buried preglacial valleys.	Has relatively high permeability; value of 870 gpd per sq ft estimated at one place. Yields water readily to properly constructed wells. Unit supplies most of the water currently pumped and potentially available.
		Till (0-84 ft. thick)	Boulders, gravel, sand, silt, and clay, unconsolidated, but poorly sorted and unstratified. Generally forms a thin mantle over bedrock surface.	Has low permeability, but yields small supplies to large diameter dug wells. In places being supplanted for domestic and farm supplies by public supply systems or bedrock wells.
Pre-Pennsylvanian		Quartz diorite, gneiss, and quartzite	Consolidated igneous and metamorphosed sedimentary bedrock underlying the unconsolidated deposits of the area.	Yield small supplies to drilled wells intercepting thin partings along joints and bedding planes. Yield depends in part on the size and arrangement of the partings, the thickness of overlying unconsolidated deposits, and the topographic situation. Median yield of 44 wells about 8 gpm.

BURIED VALLEYS

The bedrock in the vicinity of Wallum Lake is almost completely covered by glacial deposits. Valleys eroded into the bedrock during preglacial times are today partly buried by overlying deposits. In places, these preglacial valleys probably were deepened by glacial erosion.

A system of buried valleys underlies the present day Pascoag River valley and its tributaries, the Nipmuc, Clear, and Chepachet River valleys. The position and altitude of these buried valleys, as interpreted from surface geology and well data, are indicated by bedrock contours on plate 1. Geologic sections B-B', C-C', and D-D' (pl. 2) show the shape and depth of the buried valleys at three places. Section C-C' shows that the buried Nipmuc River valley is probably relatively shallow, and sections B-B' and D-D' show that the buried Clear-Pascoag River valley is deeper and that the depth increases to the east. The lowest recorded altitude of the bedrock surface is at 240 feet above sea level at well Bur. 79, near Oakland (pl. 1).

Another buried valley, tributary to the buried Pascoag Valley system, underlies the present day Chepachet River valley. The buried valley floor decreases in altitude northeastward, from about 400 feet at the south border of the area to about 240 feet above sea level near its junction with the buried Pascoag valley system. A tributary buried valley extends southward from a saddle-shaped high in the bedrock surface beneath the north end of Sucker Pond to a junction with the Chepatchet buried valley beneath Steeres Pond. The low point of this saddle is estimated to be about 425 feet above sea level, but may have been scoured lower by glacial erosion.

A small buried valley extends from beneath Wakefield Pond northward to Robbins Brook and thence westward to join a major buried valley in Connecticut (pl. 1). The depth of the floor of this buried valley is unknown, but the steep slopes of the till-mantled valley walls and the relief of the deposits on the valley floor suggest that its deepest point may lie below an altitude of 500 feet. Geologic section A-A' presents the author's interpretation of the possible position of the bedrock surface in this valley.

Other deeply-buried bedrock surfaces occur south of Bowdish and Pascoag Reservoirs, and at Keach Pond.

The buried valleys are very important feature of the geology of the Wallum Lake area. They form the major ground-water reservoirs and contain the greatest thicknesses of permeable water-bearing glacial deposits in the area. The lithology and water-bearing properties of the deposits filling the buried valleys are discussed in following sections of the text.

EXTENT, THICKNESS, AND LITHOLOGY OF THE GLACIAL DEPOSITS

Plate 1 shows the areal extent of outwash and till in the vicinity of Wallum Lake. Because of its general occurrence in other parts of Rhode Island, till is presumed to be present in many places beneath the outwash. Very small bodies of outwash occur in the till-mantled areas and, conversely, small bodies of till occur at places in the outwash-mantled areas. Because these bodies are too small to be shown at the scale of the map, they were mapped with the larger, adjacent bodies of outwash or till on plate 1.

Outwash

Extent and thickness of deposits. — The major body of outwash deposits in the vicinity of Wallum Lake underlies the broad valleys of the Nipmuc, Clear, Pascoag, and Chepachet Rivers. These deposits partly fill the bedrock valleys of the preglacial Pascoag and Chepachet Rivers and of their tributaries and comprise the most important ground-water reservoir in the study area.

Beneath the central parts of the Clear and Pascoag River valleys and in the vicinity of Mapleville in the Chepachet River valley, outwash deposits are generally more than 50 feet thick. See geologic sections B-B', D-D', pl. 2.) The maximum recorded thicknesses are 125 feet at well Bur. 79 and 50 feet at Bur. 69 (pl. 1). Well Bur. 222 penetrates 100 feet of outwash, which indicates that thicknesses greater than 50 feet are likely elsewhere in the outwash between Sucker and Steeres Ponds. Deposits underlying the Nipmuc River valley and the southern part of the Chepachet River valley are generally much less than 50 feet thick. Geologic section C-C' (pl. 2), for example, shows that the thickest outwash in that segment of the Nipmuc River valley occurs in the largely-dewatered kame terraces along the valley walls.

A smaller body of outwash deposits underlies and surrounds Wakefield Pond and the Robbins Brook valley. Based on the extended slopes of the till-mantled valley walls and the relief of the valley floor (geologic section A-A', pl. 2, and p. 9), outwash deposits north of Wakefield Pond may be as much as 50 feet thick. Deposits underlying Robbins Brook are much thinner.

Outwash deposits in the vicinities of Bowdish Reservoir and Keach Pond are generally thin, but well Glo. 127 (pl. 1) is reported to have penetrated 82 feet of outwash without striking bedrock. Therefore, a small tract of thick outwash may underlie the south shore of the Reservoir.

The small body of outwash deposits at the south end of Pascoag Reservoir has thicknesses of 60 to 95 feet (wells Glo. 131 and 129, respectively, pl. 1), but thins abruptly toward the till contacts.

Other small outwash bodies occur adjacent to Wilson Reservoir, along the upstream part of Leland Brook, and along Stingo Brook (pl. 1). The maximum thickness of outwash deposits adjacent to Wilson Reservoir is probably about 20 feet; well Bur. 121 is reported to penetrate 50 feet of sand and till above the bedrock, but most of this thickness is interpreted to be till. Near Leland Brook, the maximum known thickness of outwash is about 18 feet at well Bur. 124; most of this outwash is probably much thinner. Outwash deposits along Stingo Brook are probably less than 15 feet thick at most places.

Lithology of deposits. — The outwash deposits in the vicinity of Wallum Lake were laid down in contact with the glacial ice. Depositional environments varied widely. Some of the factors influencing deposition were: (1) thickness of ice, (2) distance of ice from point of deposition, (3) seasonal and diurnal freezing and thawing, and (4) relatively rapid changes in gradients and depositional sites due to the accretion of deposits or the wasting of adjacent ice.

As a result of the highly-changeable, glacial environment, the outwash deposits range widely, both vertically and horizontally, in grain size, in sorting, and in type, direction, and development of bedding. An example of this heterogeneous lithology occurs at the Pascoag Fire District well field in the Clear River valley. The field includes 2 supply wells, Bur. 9 and 18, and several test wells. (See pl. 1 and fig. 2.)

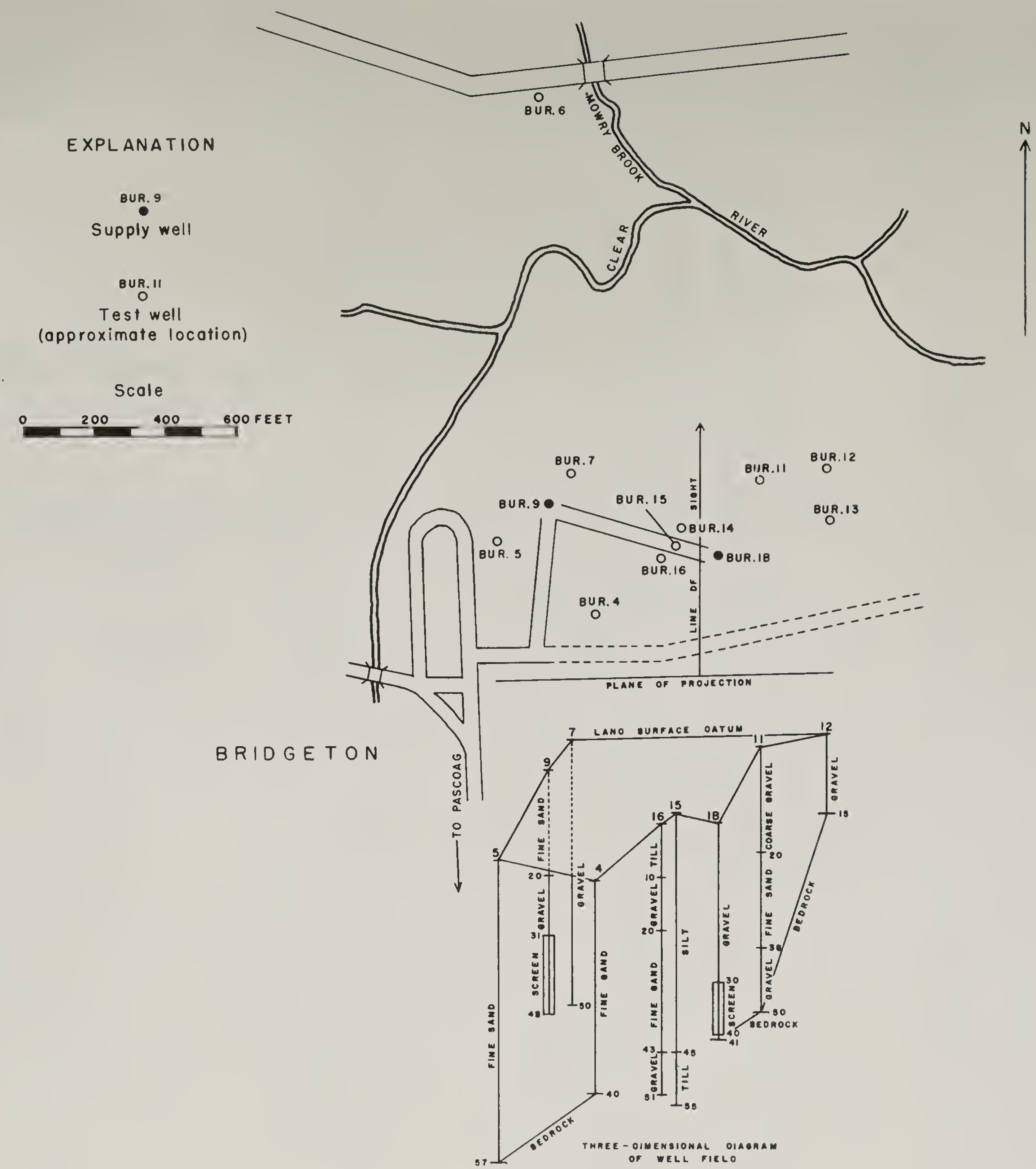
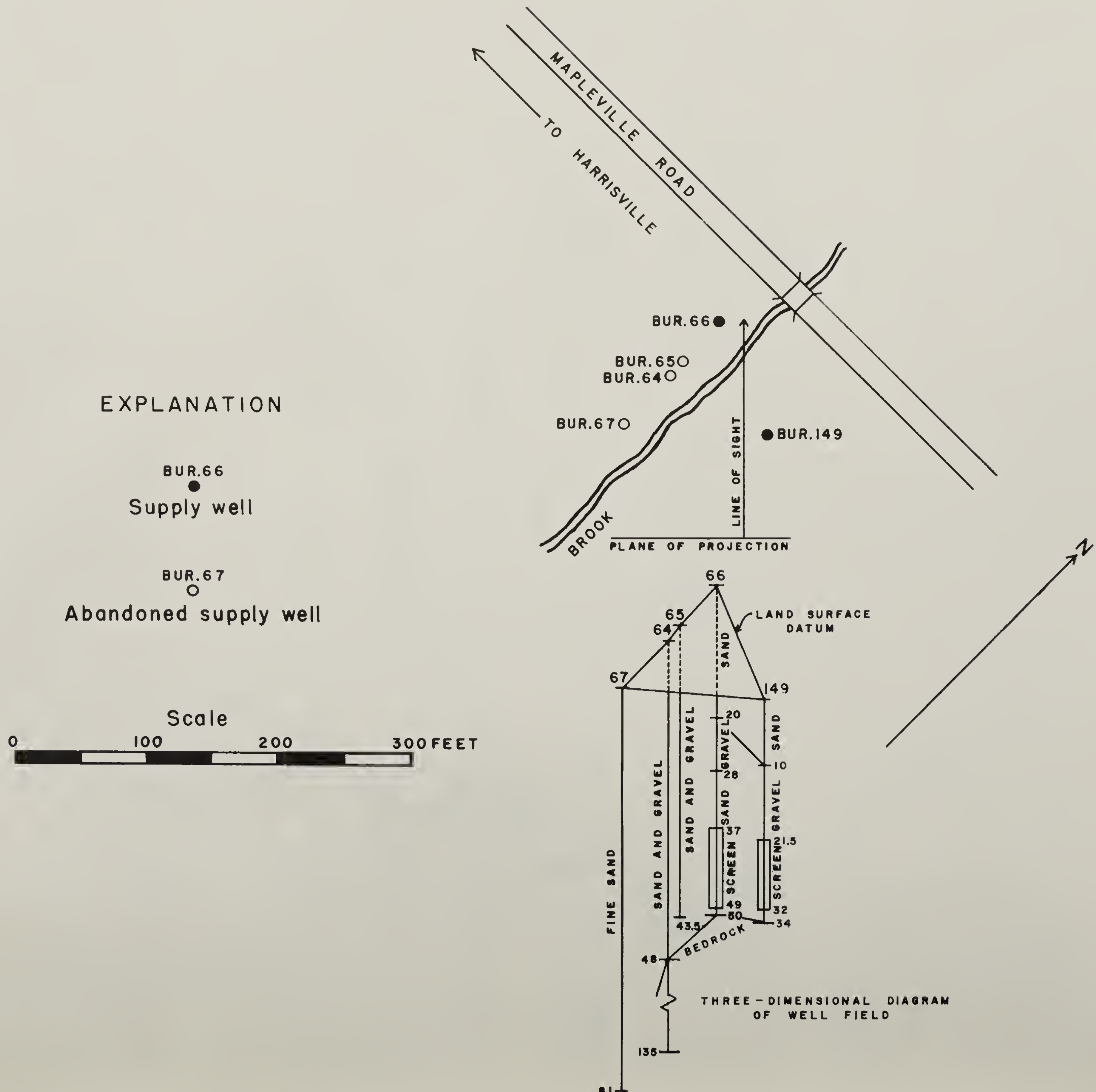


Figure 2. — Sketch map showing Pascoag Fire District well field.

Figure 3. — Sketch map showing Harrisville Fire District well field.



The Harrisville Fire District well field, in the Pascoag River valley, is less extensive and more uniform in lithology. (See pl. 1, fig. 3, table 8.)

These examples point out that not only is the lithology of the outwash deposits extremely heterogeneous, but that adequate testing is necessary to find the coarse, well-sorted, water-bearing deposits that are likely to occur in any fairly extensive body of outwash. Also, they show that the lithology of the deposits at the surface may be quite different from that of the deeper-lying deposits.

In the area between Wakefield Pond and Robbins Brook (pl. 1), relatively-uniform, very fine to medium sand is exposed at the surface. This deposit acts as a natural dam to Wakefield Pond and therefore must extend beneath the pond and to a depth equal to that of the bottom of the pond (about 20 feet, section A-A', pl. 2). Because of the general variability of ice-contact deposits in the Wallum Lake area, however, there is a possibility that coarse, water-bearing deposits may occur deeper than 20 feet.

Till

Till underlies most of the area in the vicinity of Wallum Lake (pl. 1). It typically mantles the bedrock to a thickness of about 20 feet. At many places the bedrock projects through the mantle; at other places, the till has buried upstream parts of preglacial bedrock valleys or has been so deposited against steep bedrock slopes that the vertical distance through the deposit is much greater than 20 feet. Some thick deposits may be drumlins. Thick deposits of till have been encountered; (1) along the east side of Wallum Lake, where the deposits are about 50 feet thick (Bur. 83 and 84, pl. 1) ; (2) between Dry Arm Brook and Clear River, where Bur. 119 penetrates 84 feet; (3) south of Wilson Reservoir where deposits are 50 to 60 feet thick (wells Bur 120, 127) ; and (4) as isolated thick deposits on hillslopes at wells Bur. 132 (41 feet) and 143 (57 feet), and Glo. 69 (40 feet) and 74 (60 feet). (See pl. 1 for location of wells.)

The till is light-yellowish gray, fairly loosely-packed, and sandy. Locally, bodies of till may show a pseudostratification developed by slumping or may include lenses of outwash which give the whole mass an appearance of stratification. Sorting is very poor, but most till deposits comprise two visible fractions: a profuse scattering of boulders, cobbles, and pebbles; and a matrix of very fine to very coarse sand, silt, and granule gravel. Clay occurs in small quantities.

GROUND WATER

SOURCE AND OCCURRENCE

The source of ground water in the vicinity of Wallum Lake is almost entirely local precipitation that percolates into the soil and moves downward by gravity to the zone of saturation. A relatively small amount of water enters the Wallum Lake area as underflow from adjacent areas. Replenishment occurs in the interstream tracts and water moves from these areas to discharge into springs, streams, and lakes.

Within the saturated zone, ground water occurs in pore spaces or other openings in the rocks. In the glacial deposits, openings in the zone of saturation generally consist of interconnected pore spaces between grains of sand or other material. The volume of these pore spaces determines the quantity of ground water that may be stored in a deposit; the numbers and sizes of these pore

spaces, and their degree of interconnection, determine the ability of a deposit to transmit or yield water. Some deposits of outwash, because of their larger grains and better sorting, have large, interconnected pore spaces and, hence, transmit and yield water readily. However, other outwash deposits, composed of very fine sand, silt, or clay, transmit and yield water much less readily. Till deposits, because of their poor sorting and high content of fine materials, have fewer and smaller interconnections between pore spaces and, therefore, do not readily transmit or yield water.

Ground water within the consolidated bedrock of the Wallum Lake area occurs in fractures or tabular partings; the porosity of the rock due to these openings is of the order of 1 percent or less. Thus, the ability of the bedrock to store, transmit, and yield water is largely dependent upon: (1) the areal extent, width, and granular filling (if any) of these tabular partings; (2) the topographic, lithologic, and hydrologic environments at the points where the tabular partings intercept the surface of the bedrock; and (3) the number and degree of interconnection of the partings at any site. The ability of the bedrock to store and transmit water is generally greatest near the bedrock surface. In some places, partings are so interconnected that the upper parts of the bedrock yield water as freely as the overlying glacial deposits.

WATER TABLE

Shape

The water table is the upper surface of the zone of saturation. It is generally not a level surface, but is a gently-sloping surface conforming, in a subdued fashion, to the topography of the area. Plate 3 shows the shape of the water table in the vicinity of Wallum Lake. The surface drainage divides more or less coincide with ground-water divides. Ground-water movement is perpendicular to these divides and to the water-level contours; that is, generally toward and along the streams of the area.

The geologic sections of plate 2 show generalized profiles of the water table in the outwash deposits at four sites. Section C-C' (at well Bur. 110), shows mounding of the water table that corresponds to the local topography. Sections A-A' (near A'), C-C' (near C), and D-D' (between wells Bur. 111 and 115) show a lack of such mounding. This lack of mounding is typical in the kame and kame terrace deposits along the walls of the Nipmuc, Clear, Pascoag, and Chepachet River valleys, where coarse, well-sorted sand and gravel offers little restriction to vertical or horizontal movement of water. These deposits are generally unsaturated, for most of their thickness.

The direction of ground-water movement in the deposits adjacent to Wakefield Pond is from the Pond toward Robbins Brook as indicated on geologic section A-A' (pl. 2). Presumably the low permeability of deposits of fine material on the bottom of the Pond and the low permeability of the glacial deposits at the dam prevent drainage of the Pond.

Fluctuations

The water table is not a static surface, but fluctuates in response to seasonal variations in rainfall and other additions or subtractions of water from the saturated zone. Figure 4 shows a hydrograph of monthly water-level measurements in well Nsm. 21 (about 12 miles east of Wallum Lake) and the average monthly precipitation at Greenville and Putnam. Well Nsm. 21 was selected

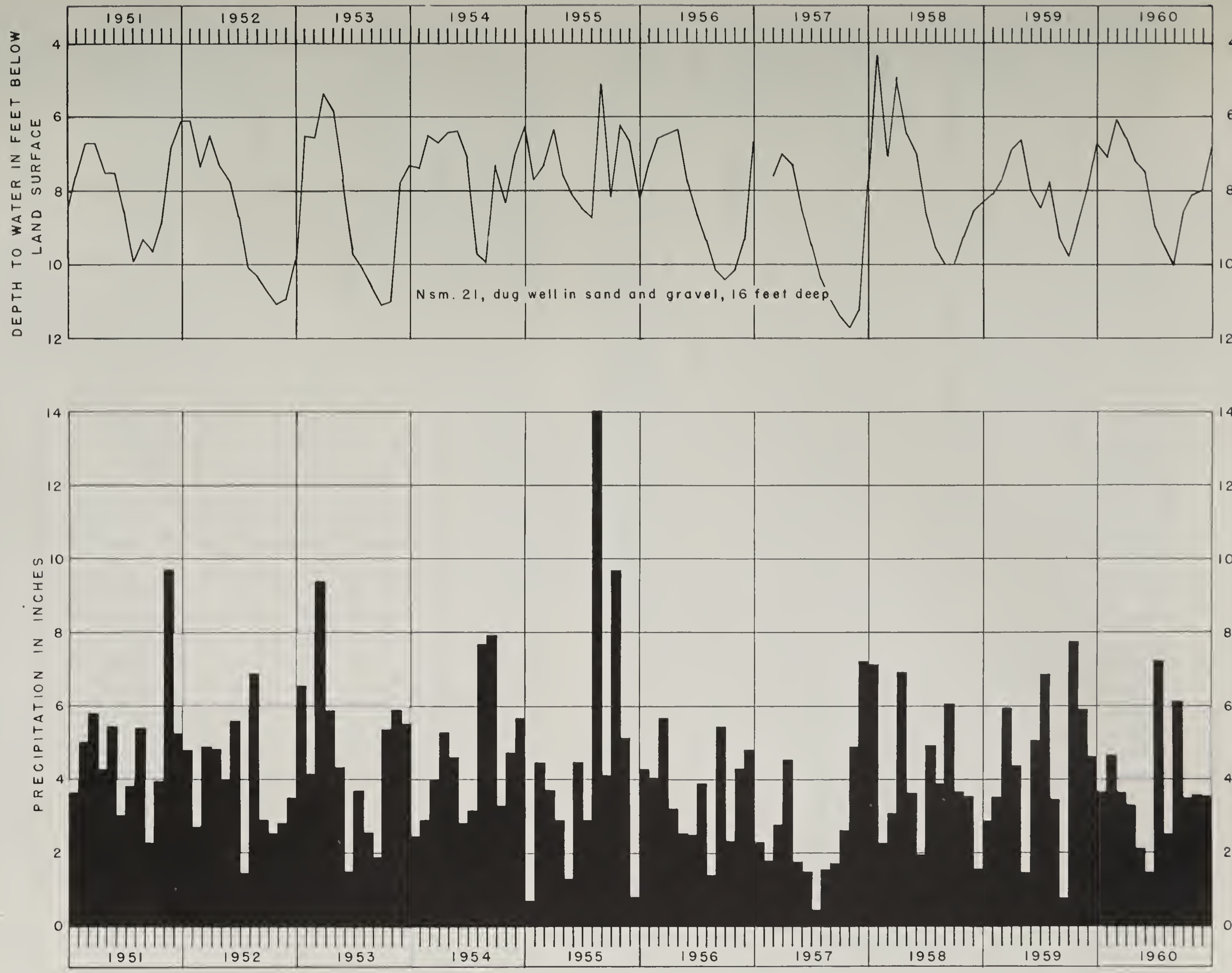


Figure 4. — Fluctuations of water level in observation well Nsm. 21 and average of precipitation at Greenville, R. I. and Putnam, Conn., 1951-60.

because its hydrologic and geologic environments are similar to those of wells penetrating outwash deposits in the vicinity of Wallum Lake. Records of water-level measurements in Nsm. 21 for the period 1947 to 1955 have been published by the Geological Survey annually in a series of water-supply papers entitled "Water Levels and Artesian Pressures in the United States; Part 1, Northeastern States"; records for 1956, 1957, and 1958-59 have been published by the R. I. Water Resources Coordinating Board as Hydrologic Bulletins 1, 2, and 4, respectively. The hydrograph shows a seasonal trend of generally high water levels between November and May, followed by a gradual decline of levels through October. In 1954, 1955, and 1959, peaks caused by tropical storms interrupt the typical summer-autumn decline of levels.

A comparison of the hydrograph with the histogram of precipitation shows that periods of high ground-water levels generally coincide with months of high precipitation. In contrast, less than half of the periods of low levels coincide with months of low precipitation. The periods of low water levels roughly coincide, however, with the growing season (generally April through October). During this time, downward percolating waters are intercepted and used by plants or evaporated (because of higher temperatures) before they can replenish the saturated zone. The saturated zone, however, continues to discharge into springs, streams, and ponds, which results in a decline of the water table. Unusually large storms, as in 1954, 1955, and 1959, which provide water in excess of that which can be utilized by plants or evaporated, may reverse this decline. During the non-growing season, a larger part of the precipitation can penetrate to the saturated zone and the water table rises.

The amount of seasonal water-table fluctuation differs with the geologic and topographic environment. Well Nsm. 21, in which annual fluctuations are about 4 to 5 feet, is representative of wells in most outwash deposits. Water levels in wells adjacent to streams, ponds, and swamps, however, fluctuate only about 1 to 3 feet; levels in wells penetrating outwash deposits high along valley walls or penetrating till deposits fluctuate as much as 10 to 20 feet. Fluctuations of water levels in wells tapping bedrock are generally about 3 to 5 feet and may not be directly related to fluctuations of the water table in the overlying glacial deposits as discussed in p. 14.

RECHARGE AND DISCHARGE

Ground-water recharge is the addition of water to the zone of saturation. The major source of recharge in the vicinity of Wallum Lake is precipitation, but a very small amount of water enters the area as underflow from adjacent areas. The average annual precipitation on the 54 square miles of the Wallum Lake area totals more than 45 billion gallons. However, because much of this area is hilly and is underlain by a thin mantle of till over bedrock (both of which transmit water poorly), a major part of this precipitation runs off directly to streams. Another large part is evaporated or transpired by plants. Only a small part percolates to the water table.

Ground water is discharged as seepage from the zone of saturation into streams or ponds. This seepage continues throughout the year, even in the summer and fall, when it maintains stream and pond levels through periods of no direct runoff. Over a period of years and under natural conditions, average discharge from a ground-water reservoir is equal to average recharge to it. Hence, either may be used as a measure of the quantity of water perennially available from a ground-water reservoir.

Median discharge of the Pascoag and Chepachet Rivers has been estimated to be about 46 million gallons per day (mgd) from a 65 square mile area above Oakland, R. I. (Lang, 1961, p. 8). This is equivalent to about 0.71 mgd per square mile or, annually, nearly 260 million gallons (mg) per square mile. Because they are topographically and geologically similar, the other stream basins in the vicinity of Wallum Lake are assumed to have similar yields.

Only a part of this median discharge is ground-water discharge, however. In the Upper Pawcatuck River basin, where outwash deposits readily store and release water to the streams, ground-water discharge nearly equals the median discharge (Lang, 1961, p. 26). In the Wallum Lake area, however, ground-water discharge to streams is through relatively impermeable till for much of the streams' lengths. There are about 3.2 square miles of till for every square mile of outwash in the Wallum Lake area; in the Upper Pawcatuck basin the ratio of till to outwash is about 1.3 to 1. On this basis, the ground-water discharge from the Wallum Lake area is estimated to be in the order of one-third the median discharge or about 87 mg per square mile annually. (See table 4.) Note that the total estimated discharge of 4.04 billion gallons is only about 9 percent of the average precipitation on the area.

Table 4.—Estimated average annual discharge from and available storage in the major ground-water reservoirs in the vicinity of Wallum Lake.

<table>
<tr><th rowspan="2">Ground-water reservoir</th><th rowspan="2">Estimated average annual discharge (millions of gallons)</th><th colspan="2">Estimated water in storage (millions of gallons)</th></tr>
<tr><th>Ground water</th><th>Surface water in ponds</th></tr>
<tr><td>Nipmuc, Clear, Pascoag, and Chepachet River valleys</td><td>3,250</td><td>1,500</td><td>—</td></tr>
<tr><td>Wakefield Pond area</td><td>290</td><td>15</td><td>220</td></tr>
<tr><td>Bowdish Reservoir area</td><td rowspan="2">500</td><td>55</td><td>250</td></tr>
<tr><td>Keach Pond area</td><td>2</td><td>63</td></tr>
<tr><td>South end of Pascoag Reservoir</td><td>—</td><td>31</td><td>720</td></tr>
<tr><td>Total ....</td><td>4,040</td><td>1,603</td><td>1,253</td></tr>
</table>

AVAILABILITY

Glacial Deposits

The quantity of water which can be withdrawn from a ground-water reservoir should be estimated from three standpoints: (1) the perennial draft, which, on the average, will not deplete storage to the point where it cannot be replenished during the next non-growing season; (2) the amount of water in storage in the reservoir which can sustain wells during prolonged dry periods; and (3) the amount of water which can be pumped at any site in the reservoir.

Perennial draft. — The major ground-water reservoirs in the vicinity of Wallum Lake are the extensive outwash deposits along the valleys of the Nipmuc, Clear, Pascoag, and Chepachet Rivers and the deposits near Wakefield Pond, Bowdish Reservoir, Keach Pond, and at the south end of Pascoag Reservoir. The amounts of water that can be perennially withdrawn from these reservoirs is roughly equivalent to the annual recharge. These amounts were conservatively estimated in table 4. Additional water is perennially available where the reservoirs are in hydraulic continuity with adjacent streams or ponds. At these sites, water that normally leaves the area as direct run-off may be salvaged by pumping from wells or collectors placed near the streams, provided that the materials of which the stream and pond bottoms are composed are relatively permeable. This induced flow may be especially significant where the extent or thickness of the ground-water reservoir is limited. Bodies of surface water also augment the storage capacities of hydraulically continuous ground-water reservoirs by their own volumes.

Three sites in the Wallum Lake area have been recommended for the construction of surface-water reservoirs (Maguire, 1952). One dam is proposed for the Nipmuc River valley about 0.75 mile upstream from the confluence of the Nipmuc and Pascoag Rivers. The resulting surface reservoir would flood about 1 square mile of land and regulate the runoff from about 16 square miles. The area to be flooded is underlain by relatively thin outwash deposits.

A second dam is proposed for the Clear River valley near the east end of Wilson Reservoir. The resulting surface reservoir would flood about 3 square miles of mostly till-mantled area; about 12 square miles of drainage area would be regulated.

The third dam is proposed for the Chepachet River at Mapleville. About 1 square mile would be flooded and runoff from about 20 square miles would be regulated. The proposed surface reservoir would flood a part of the area south of Sucker Pond, where outwash deposits of 50 or more feet in thickness are likely to occur.

Storage. — Water in the zone of saturation, because it moves so slowly from points of recharge to points of discharge, is considered to be in storage.

The quantity of stored water that can be yielded by gravity drainage from a unit volume of saturated material is called the specific yield and is expressed as a percentage of the total volume of the material. The specific yield of outwash ranges from about 1 per cent, in poorly-sorted or fine-grained deposits, to about 20 per cent, in well-sorted, coarse deposits (Lang, 1961, p. 6). Assuming that the outwash deposits of the Wallum Lake area contain about equal amounts of poorly-sorted and well-sorted materials and about equal amounts of fine-grained and coarse-grained materials, the average specific yield of the deposits is estimated to be about 10 per cent.

The total volumes of saturated outwash in the ground-water reservoirs of the Wallum Lake area were estimated by first determining average saturated thicknesses from the configuration of the bedrock-surface and water-table contours (pls. 1 and 3). Saturated deposits less than 10 feet thick were here disregarded, because they would be almost dewatered in times of drought. The average saturated thicknesses of the remaining deposits were arbitrarily decreased by 10 feet to allow for seasonal water-table fluctuations and the possible occurrence of till beneath the outwash. The adjusted saturated thicknesses were multiplied by the areal extents of the deposits concerned to give the estimated volume of saturated outwash for each ground-water reservoir. Applying the specific yield of 10 per cent to these volumes gives the estimated amounts of ground water in storage shown in table 4. The quantities of surface water stored in ponds were separately calculated by multiplying pond areas by average depths and were included in table 4.

In the small ground-water reservoirs near Wakefield Pond, Bowdish Reservoir, Keach Pond, and at the south end of Pascoag Reservoir, a larger amount of water is stored in the ponds than in the outwash deposits.

Most of this stored water could be utilized by an extensive network of wells penetrating major parts of the ground-water reservoirs. In any case, drafts of ground water in the order of the estimated annual discharges (table 4) should not permanently deplete the ground-water reservoirs. In the Wakefield Pond ground-water reservoir, for example, estimated ground-water storage alone theoretically could support a draft in the order of 250,000 gallons per day (gpd) for 2 months without recharge; with replenishment from additional water stored in the pond, this draft could be maintained nearly 3 years without recharge.

Permeability and yield. — The quantity of water that can be pumped at any particular site in a ground-water reservoir depends upon the local hydrologic environment. A relatively accurate measure of the ability of deposits to transmit water is the coefficient of permeability, which is the rate of flow of water in gallons per day through a cross-sectional area of 1 square foot under a hydraulic gradient of 1 foot per foot at a temperature of 60°F. The coefficient of permeability has been calculated to be about 870 gpd per square foot at the site of well Bur. 18 (Lang, 1960, p. 11-13). (See fig. 2, pl. 1.) This coefficient is below the average of the better water-bearing deposits of Rhode Island (op. cit., p. 34). Additional data for the Wallum Lake area are insufficient for similar calculations to be made elsewhere in the area. However, relatively high yields have been obtained at other sites in the outwash deposits (wells Bur. 9, 66, and 149, pl. 1 and table 7). These suggest that the coarser outwash deposits of the area may have coefficients of permeability in the order of 1,000 to 2,000 gpd per square foot.

Plate 4 is offered as a guide to future ground-water development in the vicinity of Wallum Lake, but not as a substitute for test drilling. The plate shows areas of glacial deposits and bedrock and the estimated maximum sustained yields from properly constructed wells. Minimum yields, in some parts of the areas, may be as low as a few gallons per minute (gpm) where the deposits include large amounts of very fine sand, silt, or clay. For example, area 1 is, on the basis of current data and interpretation, most promising for the development of large ground-water supplies. Only in the Pascoag and Harrisville Fire District well fields, however, have these deposits been tested and found productive. Indeed, at some places in these well fields, the deposits have been found to be fine-grained and unproductive (figs. 2 and 3). Also, the extent of area 1 near Sucker and Wakefield Ponds and near Bowdish Reservoir is based on very scant data (p. 13). Test drilling is necessary to locate coarse deposits of outwash in the unexplored parts of area 1.

Plate 4 indicates that large supplies of ground water are not available in areas 3 and 4. Area 4 comprises the till-mantled, hilly parts of the Wallum Lake area. Domestic or stock wells may be developed in till where the deposits are not so thin as to be completely drained during the summer-autumn decline of the water table. The adequacy and permanency of the ground-water supply available in the thin, hillside deposits of outwash patterned area 3 are only slightly better.

Consolidated Rocks

Wells tapping bedrock for their water supply are gradually replacing wells in till or in thin, hillside deposits of outwash, because the yields of the rock wells, although generally small, are more dependable.

Analysis of data from 44 wells drawing water from the bedrock, in the vicinity of Wallum Lake, show that most yield 4 to 15 gpm. The chances are as high as 9 in 10 that a well drilled into rock in this area will yield between 1 and 30 gpm, but are very slight that it will yield more than 30 gpm.

The yields of rock wells in the Wallum Lake area are not related to the thickness of bedrock penetrated. Of the 44 wells for which data are available, most penetrate 80 to 190 feet of rock. Of 12 wells yielding 15 gpm or more, only 3 penetrate more than 180 feet of rock.

Data show that most rock wells in the area are between 110 and 210 feet deep. About 80 percent of the wells range between 90 and 325 feet in depth.

UTILIZATION

The greatest use of ground water in the vicinity of Wallum Lake is about 107 mgy for public supply; the largest users are the Pascoag and Harrisville Fire Districts (table 5).

Table 5.—Annual pumpage from major public-supply wells in the vicinity of Wallum Lake, 1960.

Supply	Wells	Persons served	Annual pumpage (mg)	Change since 1955 (mg)
Pascoag Fire District	Bur. 9, 18	3,100	61.0	7.8
Harrisville Fire District	Bur. 66, 149	1,280	36.9	8.8
Stillwater Worsted Mill (Mapleville)	Bur. 69	275	3.8	-3.5
Oakland-Association	Bur. 77, 78	175	2.3	-6.8
Oakland-Robinson	Bur. 72, 73	90	1.3	-0.1
Mapleville-Pelletier	Bur. 79	44	0.7	0.0
Mapleville-Our Lady of Good Help	—	24	0.6	0.0
Total		4,988	106.6	6.2

Rural domestic and farm use of ground water in the area is unrecorded, but has been estimated to be about 182 mgy (Lang, 1961). Self-supplied industrial use of ground water is only about 7 mgy, because most local industries use surface water.

Total ground-water use, therefore, is approximately 296 mgy, or about 7 percent of the quantity of ground water estimated to be perennially available from the Wallum Lake area (table 4).

QUALITY OF WATER

The water of the Wallum Lake area, like that of other parts of Rhode Island, is generally of good chemical quality. For ions present in significant amounts in Rhode Island water, the U. S. Public Health Service drinking water standards recommends: (1) combined total concentration of iron and manganese should be less than 0.3 parts per million (ppm); (2) concentration of sulfate less than 250 ppm; (3) concentration of chloride less than 250 ppm; (4) concentration of fluoride less than 1.5 ppm; and (5) dissolved solids less than 500 ppm. Partial chemical analyses of 18 water samples (table 6) show that, except with respect to iron, these recommended concentrations are not generally exceeded in the Wallum Lake area.

Higher-than-recommended iron conncentrations have been measured in samples from well Bur. 66, the Chepachet River, and Wallum Lake; these sites have no apparent geologic or hydrologic relationship that would explain the occurrence of iron in the water. Furthermore, samples taken at other times at these sites show much lower iron concentrations. (See table 6.)

The water in the Wallum Lake area is generally soft; the highest measured hardness was 50 ppm (as calcium carbonate) for a sample from well Bur. 79. Usually, water with hardness of 1 to 60 ppm is considered soft; 61 to 120 ppm is considered moderately hard; 121 to 200 ppm is considered hard; and more than 200 ppm is considered very hard (Lamar, 1942).

Reports of well owners on the quality of water in their wells suggest that hard and soft water are encountered with about equal frequency in wells drawing water from the bedrock, but that most wells tapping water from the outwash yield soft water. Only 2 of 49 wells obtaining from the outwash are reported to yield waters high in iron. (See remarks, table 7.)

FUTURE GROUND-WATER DEVELOPMENT

Present use of ground water is only about 3 percent of the quantity estimated to be perennially available in the vicinity of Wallum Lake. Future large-scale development is limited to thick deposits of coarse, well-sorted outwash. Plate 4 defines these deposits within the limits of current data and under the assumption that fairly extensive deposits of coarse, well-sorted material may be discovered in any body of outwash after adequate testing.

Large supplies of ground water can be developed in the ground-water reservoir underlying the Nipmuc, Clear, Pascoag, and Chepachet River valleys. The most promising sites for development are at the eastern border of the area and along the Pascoag and Clear Rivers. Properly constructed wells penetrating coarse deposits should yield 150 to 350 gpm and possibly more. Comparable yields of ground water may be developed in the vicinity of Sucker Pond, but conclusive data on the

Table 6.—Chemical analyses of ground water and surface water, Wallum Lake, R. I.

(Analyses by Rhode Island Division of Sanitary Engineering unless otherwise indicated.)

Well, pond, or river	Geologic Source	Sampling depth (feet below lsd.)	Date of collection	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Total Hardness ($CaCO_3$)	Noncarbonate Hardness ($CaCO_3$)	PH
				Parts per million.															
Bur. 79	Gneiss	125 — 165	Jan. 1950	14	.10		15	2.1		9.9	30	21	9.0	0.0	3.0	117	50	33	7.2
9	Gravel	8.4 — 46	Feb. 10, 1960	—	.11	0.13	—	—	—	—	20	—	16	.0	1.3	100	40	24	5.8
9	do.	8.4 — 46	Aug. 9, 1960	—	.10	.15	—	—	—	—	18	—	15	.0	4.4	125	38	23	5.6
18	do.	4 — 40	Jan. 1950	13	.00	—	9.8	1.3		.2	11	11	—	.2	2.0	78	30	21	5.6
18	do.	4 — 40	Feb. 10, 1960	—	.00	.00	—	—	—	—	12	—	10	.0	8.9	72	32	22	5.7
18	do.	4 — 40	Aug. 9, 1960	—	.04	.00	—	—	—	—	18	—	11	.0	3.5	91	28	13	5.7
66	Sand	1.5 — 50	Jan. 1950	13	.40	—	5.0	1.1		4.1	12	5.4	7.0	.2	.0	43	17	7	6.2
66	do.	1.5 — 50	Aug. 9, 1960	—	.02	.00	—	—	—	—	17	—	5.0	.0	.0	56	10	—	5.8
149	Gravel	4.7 — 32	Feb. 10, 1960	—	.02	.00	—	—	—	—	11	—	5.0	.0	1.3	32	20	11	5.8
Chepachet River[1]	Chepachet, R. I.		Aug. 12, 1925	6.6	.71	—	2.5	.6	3.2	0.8	6	4.6	4.0	—	.0	51	9	—	6.0
Chepachet River	do.		Mar. 15, 1951	8.0	.00	—	2.0	1.5	—	—	2	5.6	6.0	—	.0	32	11	9	5.8
Do.	Mapleville, R. I., at dam.		Mar. 15, 1951	8.0	.00	—	3.6	.7	—	—	5	6.6	7.0	—	.0	34	12	8	6.0
Pascoag Reservoir[1]	Pascoag, R. I.		Aug. 3, 1924	1.9	.16	—	1.7	.9	1.7	.6	3	6.3	1.7	—	.6	21	8	—	6.2
Wakefield Pond[1]	4 mi. West of Pascoag, R. I.		May 7, 1925	.6	.16	—	2.5	.6	2.5	.3	5	6.3	2.0	—	.3	24	9	—	7.0
Do.	do.		Mar. 15, 1951	10	.00	—	2.4	.7	—	—	3	5.8	6.0	—	.0	31	9	2	6.0
Wallum Lake[1]	Wallum Lake, R. I.		Apr. 29, 1924	10	.06	—	1.4	.7	1.4	.3	2	5.6	1.9	—	.0	21	6	—	6.7
Wallum Lake	Zambarano State Hospital		Feb. 10, 1960	—	.50	.08	—	—	—	—	6	—	4.0	.0	.0	40	12	8	5.8
Do.	do.		Aug. 9, 1960	—	.03	.04	—	—	—	—	10	—	3.0	.2	.0	33	1	—	6.2

[1] Analysis made by U. S. Geological Survey, Washington, D. C.

thickness and lithology of the outwash there are scant. Supplies in the order of 20 to 150 gpm are more widely available from this ground-water reservoir. (See plate 4.)

A large amount of ground water can also be developed at the south end of Pascoag Reservoir, if exploratory testing reveals coarse-grained deposits at depth. A part of the water developed may be pond water, induced into the deposits by pumping, provided that the material of which the pond bottom is composed is relatively permeable. Total development at this site should be limited by its effect on Pascoag Reservoir.

The ground-water reservoir surrounding and underlying Wakefield Pond should be tested to determine its saturated thickness and lithology. The present interpretation, based on very scant data, suggests that a ground-water supply in the order of 150 to 300 gpm could be developed there. Part of this water may be induced recharge from the pond, provided that the material of which the pond bottom is composed is relatively permeable. Total development at this site should not exceed about 320 mgy (table 4).

Few data are available on the ground-water reservoir near Bowdish Reservoir and Keach Pond. It is possible that a large amount of ground water could be developed on the south side of Bowdish Reservoir, if the deposits are coarse-grained.

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Table 7.—Records of selected wells in the vicinity of Wallum Lake, Rhode Island
(Location of wells is shown on plate 1).

Well number: For explanation of numbering system for wells, see text p. 4

Altitude above sea level: Approximate altitude of land surface at well from U. S. Geological Survey topographic maps.

Type of well: Dr, drilled; Dn, driven; Du, dug.

Yield: Maximum reported yield; gpm, gallons per minute.
Water-bearing material: C, clay; G, gravel; R, rock; S, sand; T, till.

Use: A, abandoned; D, domestic; PS, public supply; S, stock; T, test.

Remarks: ppm, parts per million; nitrate and chloride data from R. I. Div. Sanitary Engineering; reported data from well owners.

TOWN OF BURRILLVILLE

Well no.	Location: Latitude	Location: Longitude	Owner	Altitude above sea level (feet)	Type of well	Depth (feet)	Diameter (inches)	Depth to bedrock (feet)	Water: Date of measurement	Water: Yield (gpm)	Water: Level (feet below land surface)	Water: Temperature (°F)	Water-bearing material	Use	Remarks
Bur. 1	41°56′17″	71°41′00″	Pascoag Racing Commission	453	Dr	273	6	28	June 1942	10	14		R	A	Dry
Bur. 2	41°56′25″	71°41′08″	do.	453	Dr	285	6	45	June 1942	12	9		R	A	
Bur. 3	41°56′12″	71°41′06″	do.	448	Dr	387	6	40	Apr. 1944	13	15		R	A	
Bur. 4	41°57′50″	71°42′01″	Pascoag Fire District	365	Dr	40	8	40	Sept. 21, 1944	—	10		S	T	(1)
Bur. 5	41°57′52″	71°42′05″	do.	375	Dr	57	8	57	Sept. 22, 1944	—	10		S	T	(1)
Bur. 6	41°58′05″	71°42′02″	do.	370	Dr	28	8	28	Sept. 23, 1944	—	10		S,G	T	(1)
Bur. 7	41°57′54″	71°42′02″	do.	375	Dr	50	8	—	Sept. 24, 1944	—	9.4		G	T	(1)
Bur. 9	41°57′53″	71°42′03″	do.	375	Dr	46	12	—	Oct. 26, 1944	350	8.4	48	S,G	PS	(1,2)
Bur. 11	41°57′55″	71°41′55″	do.	368	Dr	50	8	50	Oct. 1946	25	—	—	S,G	T	(1)
Bur. 12	41°57′56″	71°41′53″	do.	365	Dr	15	8	15	—	—	—	—	G	T	(1)
Bur. 13	41°57′54″	71°41′52″	do.	380	Dr	19	8	19	—	—	—	—	G	T	(1)
Bur. 14	41°57′53″	71°41′58″	do.	375	Dr	55	8	—	Oct. 1946	60	6.5	—	S,G	T	(1)
Bur. 15	41°57′53″	71°41′58″	do.	375	Dr	55	8	—	May 12, 1947	—	6.17	—	S,T	T	(1)
Bur. 16	41°57′52″	71°41′59″	do.	375	Dr	51	8	—	Nov. 1946	50	7.5	—	S,G	T	(1)
Bur. 18	41°57′52″	71°41′56″	do.	380	Dr	41	12	41	Mar. 1947	156	4	49	G	PS	(1,2)
Bur. 64	41°57′42″	71°40′10″	Harrisville Fire District	327	Dr	135	8	48	July 20, 1940	50	—	—	R	A	(1)
Bur. 65	41°57′42″	71°40′10″	do.	327	Dr	43.5	14	—	Aug. 1940	52	—	—	S,G	A	(1)
Bur. 66	41°57′43″	71°40′10″	do.	327	Dr	50	14	50	July 1940	160	1.5	51	S,G	PS	(1,2)
Bur. 67	41°57′41″	71°40′10″	do.	327	Dr	61	6	—	—	—	—	—	S	T	(1)
Bur. 68	41°58′10″	71°40′17″	Harrisville Co.	383	Dr	410	10	25	Nov. 9, 1918	22	—	—	R	PS	Inadequate supply in summer.
Bur. 69	41°56′50″	71°38′47″	Stillwater Worsted Mill	330	Dr	202	8	50	Nov. 12, 1[illegible]6	60	Flows	—	R	PS	
Bur. 72	41°57′28″	71°38′55″	H. P. Remington Estate	320	Du	21.5	30	—	Sept. [illegible], [illegible]49	—	18.4	—	G	D	Water reported soft.
Bur. 75	41°57′18″	71°42′46″	E. A. Peck	453	Dr	160	6	2	Aug. 30, 1947	20	Flows	50	R	D,S	Water reported hard.
Bur. 76	41°56′56″	71°41′38″	D. H. Salisbury	532	Dr	206	6	20	Sept. 1910	5½	24	—	R	D	
Bur. 79	41°57′14″	71°39′00″	W. A. Pelletier	365	Dr	165	8	125	Sept. 9, 1949	6	46	49	R	PS	(2)
Bur. 81	41°59′07″	71°45′31″	L. J. Emond	608	Du	8.7	24	—	May 23, 1955	—	2.52	—	T	D	Well has gone dry.
Bur. 83	41°59′57″	71°45′46″	F. Cambia	592	Dr	120	4	47	Sept. 1952	10	18	—	R	D	Water reported soft.
Bur. 84	41°59′55″	71°45′40″	M. Smith	578	Dr	100	6	50	1954	8	12	—	R	D	
Bur. 85	42°00′24″	71°45′15″	M. Gilmore	705	Dr	500	6	—	1925	15	20	—	R	PS	Water reported soft.
Bur. 86	41°58′00″	71°42′30″	W. Place	418	Du	12.1	30	—	Oct. 19, 1960	—	6.56	—	S,G	A	
Bur. 87	41°57′59″	71°42′32″	A. Green	425	Du	28.2	30	—	Oct. 19, 1960	—	12.40	—	S,G	A	
Bur. 88	41°57′56″	71°42′32″	R. Diamond	425	Du	12.5	30	—	Oct. 19, 1960	—	5.90	57	S,G	A	

Table 7.—Records of selected wells in the vicinity of Wallum Lake, Rhode Island—Continued
(Location of wells is shown on plate 1).

TOWN OF BURRILLVILLE—(Continued)

Well no.	Location: Latitude	Location: Longitude	Owner	Altitude above sea level (feet)	Type of well	Depth (feet)	Diameter (inches)	Depth to bedrock (feet)	Water: Date of measurement	Water: Yield (gpm)	Water: Level (feet below land surface)	Water: Temperature (°F)	Water-bearing material	Use	Remarks
Bur. 89	41°57′46″	71°42′23″	A. Poulos	432	Du	15.4	30	—	Oct. 19, 1960	—	9.16	—	S,G	A	
Bur. 90	41°57′49″	71°42′41″	J. Zifcak	425	Du	10.3	30	—	Oct. 19, 1960	—	5.35	56	S,G	A	13 ppm nitrate; 6 ppm chloride.
Bur. 91	41°57′43″	71°43′36″	G. McCabe	435	Du	12.4	40	12.4	Oct. 19. 1960	—	7.39	—	S,G	A	
Bur. 92	41°57′32″	71°42′22″	Community Baptist Church	452	Du	17.4	40	17.4	Oct. 19, 1960	—	10.38	—	T	A	
Bur. 93	41°57′27″	71°42′22″	F. Shaw	430	Du	9.6	30	9.6	Oct. 19, 1960	—	4.10	—	T	A	
Bur. 94	41°58′02″	71°41′43″	F. Mildner	382	Du	15.9	36	—	Oct. 24, 1960	—	11.43	—	G	D	
Bur. 95	41°58′03″	71°42′13″	C. Palladini	368	Du	9.3	30	—	Oct. 24, 1960	—	5.28	—	S,G	D	
Bur. 96	41°58′07″	71°42′21″	A. Lagace	371	Du	7.2	36	—	Oct. 24, 1960	—	4.92	—	S,G	A	
Bur. 97	41°58′03″	71°42′39″	O. Richardson	428	Du	19.9	30	—	Oct. 24, 1960	—	13.69	—	S,G	A	
Bur. 98	41°58′14″	71°42′03″	G. Thomas	385	Du	15.3	30	15.3	Oct. 24, 1960	—	9.46	—	T	A	
Bur. 99	41°58′25″	71°41′46″	F. M. Young	415	Du	21.8	30	—	Oct. 24, 1960	—	16.63	—	S,G	D	Well has gone dry. Water reported soft.
Bur. 100	41°58′11″	71°41′43″	C. Boss	402	Du	14.7	36	—	Oct. 24, 1960	—	10.77	—	S,G	D	
Bur. 101	41°58′21″	71°41′25″	A. Cornellas	390	Du	9.8	30	—	Oct. 24, 1960	—	6.02	—	S,G	A	
Bur. 102	41°58′36″	71°41′24″	R. Rivet	370	Dr	80	6	32	1952	5	19	—	R	D	2.2 ppm nitrate, 6 ppm chloride.
Bur. 103	41°58′53″	71°41′43″	A. Mottola	392	Du	24.4	36	24.4	Oct. 24, 1960	—	20.74	—	S,G	D	Water reported hard.
Bur. 104	41°59′06″	71°41′45″	M. Konopka	395	Du	33.1	36	—	—	—	—	—	S	A	Dry.
Bur. 105	41°59′18″	71°41′42″	G. Lafond	390	Du	25.1	36	25.1	Oct. 25, 1960	—	22.77	—	S,G	D	Water reported hard.
Bur. 106	41°59′40″	71°41′42″	M. E. Young	398	Dr	130	6	42	1947	5	28	—	R	D	
Bur. 107	41°59′50″	71°41′52″	M. Thatcher	385	Du	7.2	40	—	Oct. 25, 1960	—	3.05	—	S,G	D	
Bur. 108	41°59′59″	71°42′04″	F. Valcourt	405	Dr	144	6	14.3	Oct. 25, 1960	8	7.79	—	R	D	Water reported hard.
Bur. 109	41°59′14″	71°41′03″	R. Foster	412	Du	16.2	36	—	Oct. 25, 1960	—	12.58	—	S,G	A	
Bur. 110	41°58′37″	71°40′54″	do.	392	Du	25.5	30	—	Oct. 25, 1960	—	22.58	—	S,G	A	
Bur. 111	41°58′20″	71°40′44″	H. Haggas	345	Du	15.4	36	—	Oct. 25, 1960	—	10.99	—	S,G	D	
Bur. 112	41°58′05″	71°41′06″	A. Scurka	350	Du	10.5	36	—	Oct. 26, 1960	—	6.25	—	S,G	A	
Bur. 113	41°57′59″	71°40′57″	P. V. Rabideau	350	Du	14.2	24	—	Oct. 26, 1960	—	9.05	—	S,G	D	Well has gone dry.
Bur. 114	41°57′59″	71°40′49″	E. and M. Rabideau	352	Du	22.9	24	—	Oct. 26, 1960	—	18.74	—	S,G	A	
Bur. 115	41°58′09″	71°40′54″	F. F. Girouard	345	Du	14.7	36	—	Oct. 26, 1960	—	11.05	—	S,G	A	
Bur. 116	41°58′07″	71°46′18″	O. O'Toole	695	Dr	150	6	18	Nov. 3, 1960	5	40.09	—	R	A	
Bur. 117	41°58′45″	71°47′55″	—	545	Du	16.9	36	—	Nov. 3, 1960	—	7.58	—	T	D	
Bur. 118	41°57′53″	71°47′40″	Camp Winnesuckett, Boy Scouts of Amer.	560	Du	12.8	30	—	Nov. 3, 1960	—	6.16	—	S,G	D	
Bur. 119	41°58′37″	71°45′18″	M. Furgasson	558	Dr	116	6	84	1959	6	—	—	R	D	
Bur. 120	41°57′57″	71°43′38″	W. Richardson	468	Dr	180	6	60	1958	3	—	—	R	A	
Bur. 121	41°57′52″	71°43′22″	G. H. Beckwith	448	Dr	132	6	50	1959	3	Flows	—	R	D	
Bur. 122	41°57′34″	71°43′11″	W. Sherman	475	Dr	85	6	12	—	—	—	—	R	D	
Bur. 123	41°57′49″	71°44′28″	M. Letendre	563	Dr	180	6	4	1958	20	—	—	R	D,S	
Bur. 124	41°57′15″	71°44′42″	E. Vock	580	Du	18.4	30	18.4	Nov. 3, 1960	—	11.27	—	S,G	A	

Table 7.—Records of selected wells in the vicinity of Wallum Lake, Rhode Island—Continued
(Location of wells is shown on plate 1).

TOWN OF BURRILLVILLE—(Continued)

Well no.	Location: Latitude	Location: Longitude	Owner	Altitude above sea level (feet)	Type of well	Depth (feet)	Diameter (inches)	Depth to bedrock (feet)	Water: Date of measurement	Water: Yield (gpm)	Water: Level (feet below land surface)	Water: Temperature (°F)	Water-bearing material	Use	Remarks
Bur. 125	41°57′16″	71°45′00″	C. O'Reilly	615	Du	10.8	40	10.8	Nov. 3, 1960	—	2.95	—	S,G	A	Well has gone dry.
Bur. 126	41°56′59″	71°44′48″	W. Underwood	620	Du	13.0	36	13.0	Nov. 3, 1960	—	7.52	—	S,G	A	
Bur. 127	41°57′56″	71°43′49″	A. Cockrane	445	Dr	146	6	50	1958	11	—	—	R	D	
Bur. 128	41°57′56″	71°43′55″	O. G. Knight	450	Du	16.3	36	—	Nov. 4, 1960	—	5.10	—	S,G	D,S	
Bur. 129	41°57′58″	71°44′04″	L. Rankowitz	460	Du	13.8	36	—	Nov. 4, 1960	—	4.33	—	S,G	D	
Bur. 130	41°56′40″	71°44′27″	M. Lorenz	615	Du	14.0	30	14.0	Nov. 4, 1960	—	6.40	—	S,G	D	Well has gone dry; water reported high in iron.
Bur. 131	41°58′36″	71°43′18″	C. W. Knibb	568	Dr	158	6	29	1952	3	14	—	R	D,S	3.1 ppm nitrate; 7 ppm chloride; water reported hard.
Bur. 132	41°59′23″	71°44′08″	R. W. Diamond	662	Dr	171	6	41	June 1940	25	—	—	R	D,S	Water reported hard.
Bur. 133	41°58′27″	71°42′09″	A. E. Jones	425	Dr	200	6	2	—	—	—	—	R	D	
Bur. 134	42°00′34″	71°42′38″	G. C. Vacher	450	Du	16.8	36	—	Nov. 4, 1960	—	2.99	—	S,G	D	
Bur. 135	42°00′11″	71°42′12″	W. Farley	422	Dr	120	6	30	1958	12	—	—	R	D,S	
Bur. 136	42°00′06″	71°41′35″	A. Molles	415	Du	17.2	30	—	Nov. 4, 1960	—	11.70	—	S,G	D	
Bur. 137	42°00′26″	71°41′25″	A. Lefebvre	480	Dr	145	6	19	1955	4	18	—	R	D	2.2 ppm nitrate; 7 ppm chloride.
Bur. 138	42°00′17″	71°41′17″	Wallum Lake Rod and Gun Club	443	Du	20.8	24	—	Nov. 4, 1960	—	15.43	—	S,G	A	
Bur. 139	42°00′12″	71°40′52″	—	448	Du	13.4	36	13.4	Nov. 4, 1960	—	10.45	—	S,G	D	
Bur. 140	41°56′39″	71°44′02″	R. Myles	655	Dr	76	6	10	1956	6	—	—	R	D,S	
Bur. 141	41°58′46″	71°44′08″	H. R. Barker	522	Dr	212	6	5	1938	12	—	—	R	D	Water reported hard.
Bur. 142	41°58′25″	71°40′20″	—	397	Du	8.4	24	—	Nov. 7, 1960	—	1.90	—	S,G	A	
Bur. 143	41°58′36″	71°40′23″	P. Yagnasac	450	Dr	205	4	57	1958	4	—	—	R	D	8.9 ppm nitrate; 18 ppm chloride.
Bur. 144	41°58′03″	71°41′32″	L. Coutu	380	Dr	72	6	36	1960	5	—	—	R	D	
Bur. 145	41°58′23″	71°41′47″	L. Lawrence	417	Dr	92	6	68	1958	40	—	—	R	D	
Bur. 146	41°58′14″	71°41′44″	L. Lacey	412	Dr	97	6	65	1958	15	—	—	R	D	
Bur. 147	41°58′13″	71°39′23″	F. Lawrence	415	Dr	490	6	8	1955	100	—	—	R	D,S	
Bur. 148	41°56′32″	71°42′15″	J. Finnegan	458	Dr	100	6	20	1958	30	—	—	R	D	3 ppm chloride.
Bur. 149	41°57′43″	71°40′09″	Harrisville Fire District	327	Dr	34	12	34	July 17, 1958	350	4.7	45	G	PS	(1,2)
Bur. 150	41°55′56″	71°47′51″	R. I. Div. Parks and Recreation	538	Dr	275	6	27	1953	30	12	—	R	PS	
Bur. 222	41°56′05″	71°39′42″	T. H. Grimshaw	465	Dr	280	6	100	1941	3	—	—	R	D	Water reported soft.

TOWN OF GLOCESTER

Well no.	Location: Latitude	Location: Longitude	Owner	Altitude above sea level (feet)	Type of well	Depth (feet)	Diameter (inches)	Depth to bedrock (feet)	Water: Date of measurement	Water: Yield (gpm)	Water: Level (feet below land surface)	Water: Temperature (°F)	Water-bearing material	Use	Remarks
Glo. 66	41°54′55″	71°40′18″	W. S. Hardman	428	Du	18.6	40	18.6	Sept. 1, 1949	—	15.2	—	C	D	Water reported hard.
Glo. 68	41°54′56″	71°40′14″	R. Fisbee	423	Dr	385	4	14	1935	4	—	52	R	D	do.
Glo. 69	41°54′59″	71°40′21″	J. Hopkins	435	Dr	150	6	40	July 1949	6	12	57	R	D	Water reported soft.
Glo. 70	41°55′00″	71°40′36″	P. Townend	462	Du	24.6	30	24.6	Sept. 2, 1949	—	13.2	—	T	D	10 ppm chloride; 25 ppm total hardness.
Glo. 71	41°55′02″	71°40′37″	do.	458	Dr	60	6	24	Sept. 2, 1949	—	8	—	R	A	3 ppm chloride; 25 ppm total hardness.

Table 7.—Records of selected wells in the vicinity of Wallum Lake, Rhode Island—Continued
(Location of wells is shown on plate 1).

TOWN OF GLOCESTER—(Continued)

Well no.	Location: Latitude	Location: Longitude	Owner	Altitude above sea level (feet)	Type of well	Depth (feet)	Diameter (inches)	Depth to bedrock (feet)	Water: Date of measurement	Water: Yield (gpm)	Water: Level (feet below land surface)	Water: Temperature (°F)	Water-bearing material	Use	Remarks
Glo. 72	41°54′45″	71°40′09″	I. T. Paine	425	Du	19.1	30	—	Sept. 2, 1949	—	17	—	C	D	Water reported soft.
Glo. 74	41°55′29″	71°38′55″	S. B. and E. M. Steere	495	Dr	347	6	60	—	2½	—	—	R	A	Well has gone dry.
Glo. 75	41°55′27″	71°39′00″	do.	445	Du	14.3	168	—	Sept. 2, 1949	—	9.2	—	S,G	D,S	Water reported soft.
Glo. 76	41°54′40″	71°40′03″	M. Farnum	430	Dr	210	6	20	1925	7	—	54	R	D	Water reported hard.
Glo. 121	41°55′33″	71°46′37″	A. Brouillard	573	Du	7.7	30	—	Nov. 8, 1960	—	2.96	—	G	D	Water reported soft.
Glo. 122	41°55′09″	71°46′52″	C. J. Sparks	578	Du	9.6	36	—	Nov. 8, 1960	—	5.06	—	G	D	do.
Glo. 123	41°55′09″	71°46′29″	W. J. Cote	587	Dr	27	1½	—	Nov. 8, 1960	—	15	—	S	D	do.
Glo. 124	41°55′02″	71°46′12″	Yellow Camp	575	Du	8.4	36	—	Nov. 8, 1960	—	4.59	—	S	D	
Glo. 125	41°54′52″	71°46′12″	E. E. Mason	605	Dr	110	6	28	1955	3⅓	—	—	R	D	Water reported soft.
Glo. 127	41°55′11″	71°46′36″	P. DeFusco	580	Dr	82	6	—	1952	10	12	—	S,G	PS	Water reported high in iron.
Glo. 128	41°55′08″	71°45′34″	A. Pagano	622	Dr	132	6	18	1960	10	—	—	R	D	
Glo. 129	41°55′30″	71°43′02″	W. Collins	500	Dr	130	6	95	1943	24⅓	—	—	R	PS	Water reported soft.
Glo. 130	41°55′33″	71°42′59″	R. Cooke	488	Dr	307	6	90	Aug. 1959	1½	46	—	R	D	do.
Glo. 131	41°55′36″	71°42′47″	G. Ballou	452	Dr	200	6	60	1959	2	30	—	R	D	
Glo. 132	41°55′36″	71°42′49″	W. W. Sayward	460	Dr	25	1½	—	Sept. 1960	8	18	—	S,G	D	
Glo. 133	41°55′11″	71°42′41″	I. Rosenberg	478	Dr	104	6	14	1958	2	—	—	R	D	
Glo. 136	41°55′28″	71°40′13″	W. Glasco	412	Du	35.0	36	—	May 15, 1961	—	26.63	—	S,G	D	Water reported soft.

[1] For additional data see logs of wells with descriptive notes, table 8.

[2] For chemical analysis, see table 6.

Table 8.—Logs of wells, with descriptive notes.

Bur. 4. Pascoag Fire District. Test well 1. Lat. 41°57′50″, long. 71°42′01″. About 350 feet southeast of Bur. 9. (See below.) Drilled by R. E. Chapman Co. in September 1944. Altitude of land surface about 365 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Fine sand	40	40
Rock at		40

Casing: 8-inch.

Static water level: 10 feet.

Bur. 5. Pascoag Fire District. Test well 2. Lat. 41°57′52″, long. 71°42′05″. About 180 feet southwest of Bur. 9. (See below.) Drilled by R. E. Chapman Co. in September 1944. Altitude of land surface about 375 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Fine sand	57	57
Rock at		57

Casing: 8-inch.

Static water level: 10 feet.

Bur. 6. Pascoag Fire District. Test well 3. Lat. 41°58′05″, long. 71°42′02″. About 1,150 feet north of Bur. 9. (See below.) Drilled by R. E. Chapman Co. in September 1944. Altitude of land surface about 370 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Fine sand	20	20
Gravel, good	8	28
Rock at		28

Casing: 8-inch.

Static water level: 10 feet.

Bur. 7. Pascoag Fire District. Test well 4. Lat. 41°57′54″, long. 71°42′02″. About 100 feet northeast of Bur. 9. (See below.) Drilled by R .E. Chapman Co. in September 1944. Altitude of land surface about 375 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Gravel	50	50
Boulders at		50

Casing: 8-inch.

Static water level: 9:4 feet.

Bur. 9. Pascoag Fire District. Supply well 1. Lat. 41°57′53″, long. 71°42′03″. About 1,000 feet southwest of the confluence of Mowry Brook with Clear River. Drilled by R. E. Chapman Co. in October 1944. Altitude of land surface about 375 feet above sea level. Driller's log.[1]

	Thickness (feet)	Depth (feet)
Fine sand	20	20
Gravel	26	46

Casing: 12-inch.
Screen: 15 feet of 12-inch with bottom at 46 feet; gravel-packed.
Pumping test:
October 26, 1944.

Duration	29	hours.
Static water level	8.4	feet.
Drawdown	17	feet.
Yield	350	gpm.
Specific capacity	21	gpm/ft.

Bur. 11. Pascoag Fire District. Test well 1. Lat. 41°57′55″, long. 71°41′55″. About 600 feet east of Bur. 9. Drilled by R. E. Chapman Co. in October 1946. Altitude of land surface about 368 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Gravel, coarse	20	20
Sand, fine	18	38
Gravel, fine	12	50
Rock at		50

Casing: 8-inch.
Screen: 8-inch with bottom at 50 feet.
Yield: 25 gpm.

Bur. 12. Pascoag Fire District. Test well 2. Lat. 41°57′56″, long. 71°41′53″. About 800 feet east of Bur. 9. Drilled by R. E. Chapman Co. in October 1946. Altitude of land surface about 365 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Gravel, muddy	15	15
Rock at		15

Casing: 8-inch.

Bur. 13. Pascoag Fire District. Test well 3. Lat. 41°57′54″, long. 71°41′52″. About 800 feet east of Bur. 9 and 150 feet south of Bur. 12. Drilled by R. E. Chapman Co. in October 1946. Altitude of land surface about 380 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Gravel, muddy	19	19
Rock at		19

Casing: 8-inch.

[1] Bur. 8, an 8-inch test well, and Bur. 10, a 2-inch observation well, were drilled at this site.

Bur. 14. Pascoag Fire District. Test well 4. Lat. 41°57′53″, long. 71°41′58″. About 380 feet southeast of Bur. 9. Drilled by R. E. Chapman Co. in October 1946. Altitude of land surface about 375 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Gravel, coarse	15.0	15.0
Sand, fine	26.0	41.0
Gravel, muddy	4.0	45.0
Gravel, clean	6.5	51.5
Gravel and hardpan (till)	3.5	55.0

Casing: 8-inch.
Screen: 8-inch with bottom at 51.5 feet.

Pumping test:

Duration	1½ hours.
Static water level	6.5 feet.
Drawdown	10.5 feet.
Yield	60 gpm.

Bur. 15. Pascoag Fire District. Test well 5. Lat. 41°57′53″, long. 71°41′58″. About 380 feet southeast of Bur. 9 and 55 feet south of Bur. 14. Drilled by R. E. Chapman Co. in November 1946. Altitude of land surface about 375 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Silt, fine	45	45
Hardpan (till)	10	55

Casing: 8-inch.
Static water level: 6.17 feet.

Bur. 16. Pascoag Fire District. Test well 6. Lat. 41°57′52″, long. 71°41′59″. About 350 feet southeast of Bur. 9 and 50 feet southwest of Bur. 15. Drilled by R. E. Chapman Co. in November 1946. Altitude of land surface about 375 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Loam, sandy	5	5
Hardpan (till?)	5	10
Gravel	10	20
Sand, fine	23	43
Gravel, good	8	51
Hardpan (till) at		51

Casing: 8-inch.
Screen: 8-inch screen with bottom at 51 feet.

Pumping test:

Duration	24 hours.
Static water level	7.5 feet.
Drawdown	15 feet.
Yield	50 gpm.

Bur. 18. Pascoag Fire District. Supply well 2. Lat. 41°57′52″, long. 71°41′56″. About 500 feet southeast of Bur. 9. Drilled by R. E. Chapman Co. in March 1947. Altitude of land surface about 380 feet above sea level. Driller's log.[2]

	Thickness (feet)	Depth (feet)
Topsoil	2	2
Gravel, brown	8	10
Gravel, water-bearing	31	41
Rock at		41

Casing: 12-inch.

Screen: 10 feet of 12-inch, no. 250 slot, bottom at 40 feet; gravel-packed.

Pumping test:

March 1947.

Duration	24	hours.
Static water level	4	feet.
Drawdown	22	feet.
Yield	156	gpm.
Specific capacity	7	gpm/ft.

Bur. 64. Harrisville Fire District. Abandoned supply well. Lat. 41°57′42″, long. 71°40′10″. About 100 feet south of Mapleville Road. Drilled by Barker Artesian Well Co. in July 1940. Altitude of land surface about 327 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Sand and gravel	48	48
Rock	48	135

Casing: 8-inch.

Yield: 50 gpm.

Bur. 65. Harrisville Fire District. Abandoned supply well. Lat. 41°57′42″, long. 71°40′10″. About 85 feet south of Mapleville Road. Drilled by Barker Artesian Well Co. in August 1940. Altitude of land surface about 327 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Sand and gravel	43.5	43.5

Casing: 14-inch.

Screen: 12 feet of 12-inch screen.

Yield: 52 gpm.

[2] Bur. 17, an 8-inch test well, and Bur. 19, a 1¾-inch observation well, were drilled at this site.

Bur. 66. Harrisville Fire District. Supply well 1. Lat. 41°57′43″, long. 71°40′10″. About 45 feet south of Mapleville Road. Drilled by Barker Artesian Well Co. in July 1940. Altitude of land surface about 327 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Sand	20	20
Gravel	8	28
Sand	22	50
Rock at		50

Casing: 14-inch.

Screen: 12 feet of 12-inch screen with bottom at 49 feet.

Pumping test:

Duration	24	hours.
Static water level	1.5	feet.
Drawdown	20	feet.
Yield	160	gpm.
Specific capacity	8	gpm/ft.

Bur. 67. Harrisville Fire District. Test well 4. Lat. 41°57′41″, long. 71°40′10″. About 150 feet south of Mapleville Road. Drilled by Barker Artesian Well Co. in August 1940. Altitude of land surface about 327 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Quicksand (fine to very fine sand and silt)	61	61

Casing: 6-inch.

Bur. 149. Harrisville Fire District. Supply well 2. Lat. 41°57′43″, long. 71°40′09″. About 80 feet south of Mapleville Road and 90 feet southeast of Bur. 66. Drilled by R. E. Chapman Co. in July 1958. Altitude of land surface about 327 feet above sea level. Driller's log.

	Thickness (feet)	Depth (feet)
Topsoil	2	2
Sand, fine	3	5
Sand, medium	5	10
Gravel, medium	10	20
Gravel, coarse, water-bearing	5	25
Gravel, very coarse, water-bearing	7	32
Gravel, hard packed, no circulation (till?)	2	34
Rock at		34

Casing: 12-inch.

Screen: 10.5 feet of 12-inch screen with bottom at 32 feet.

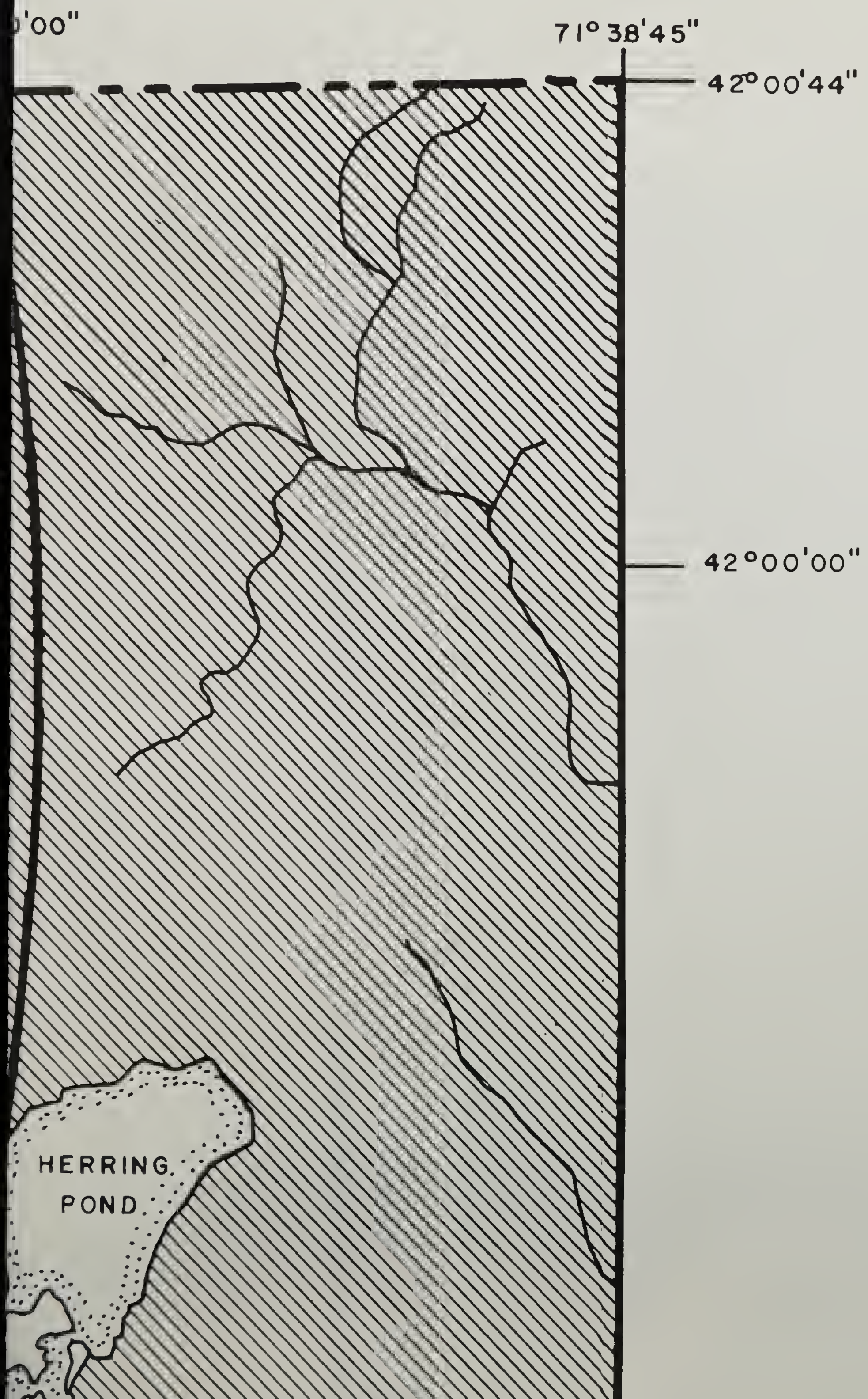
Pumping test:

Duration	8	hours.
Static water level	4.7	feet.
Drawdown	8	feet.
Yield	350	gpm.
Specific capacity	44	gpm/ft.

INDEX

INDEX—Continued

PLATE I



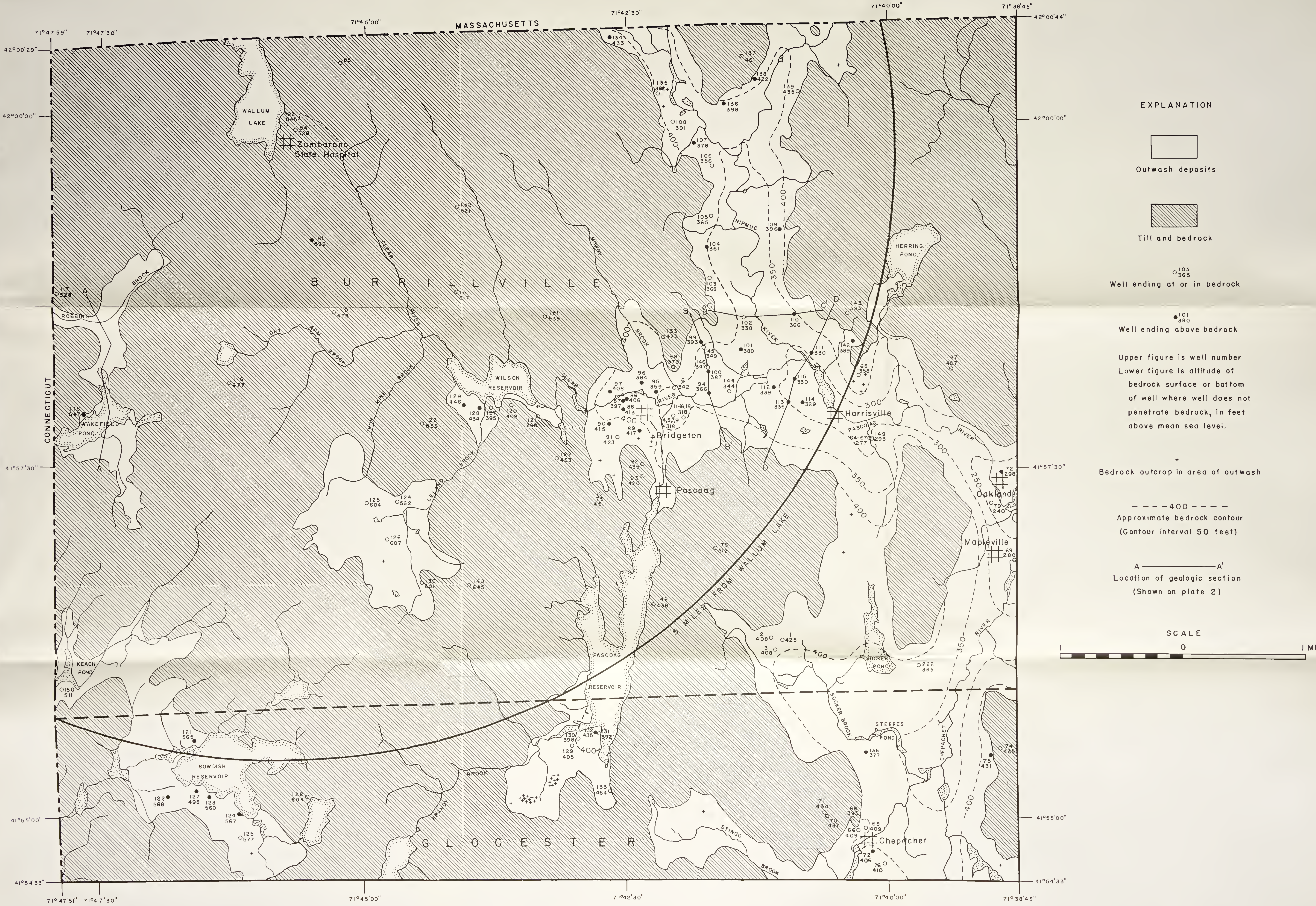
EXPLANATION

Outwash deposits

Till and bedrock

○ 105 / 365

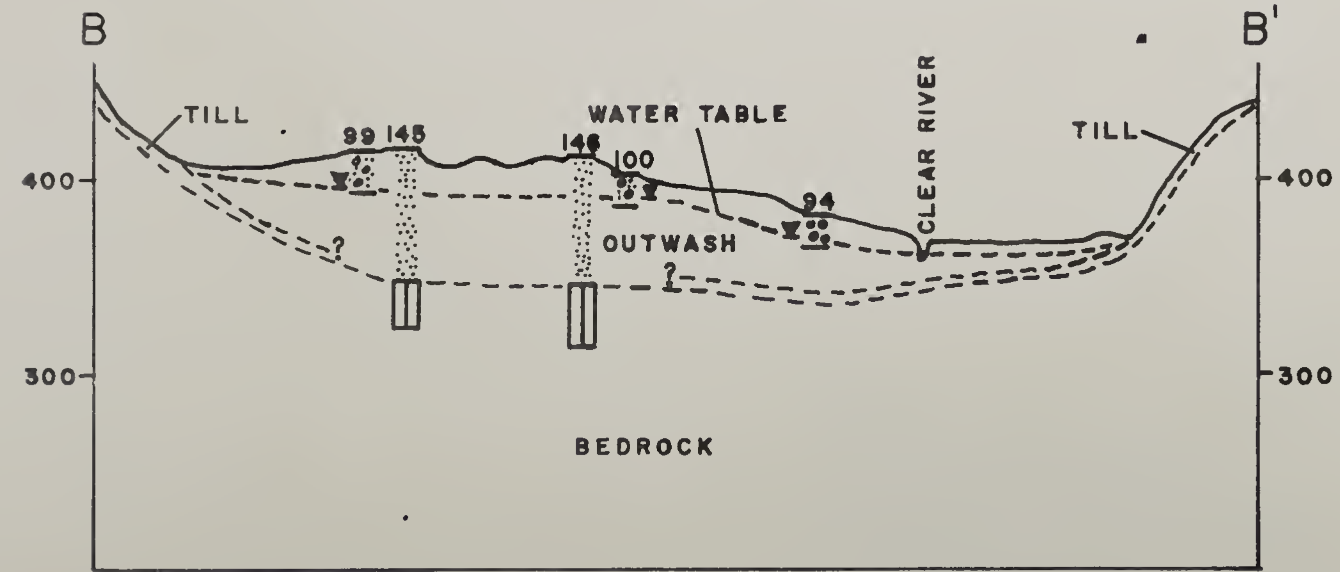
Well ending at or in bedrock



WALLUM LAKE AREA, RHODE ISLAND

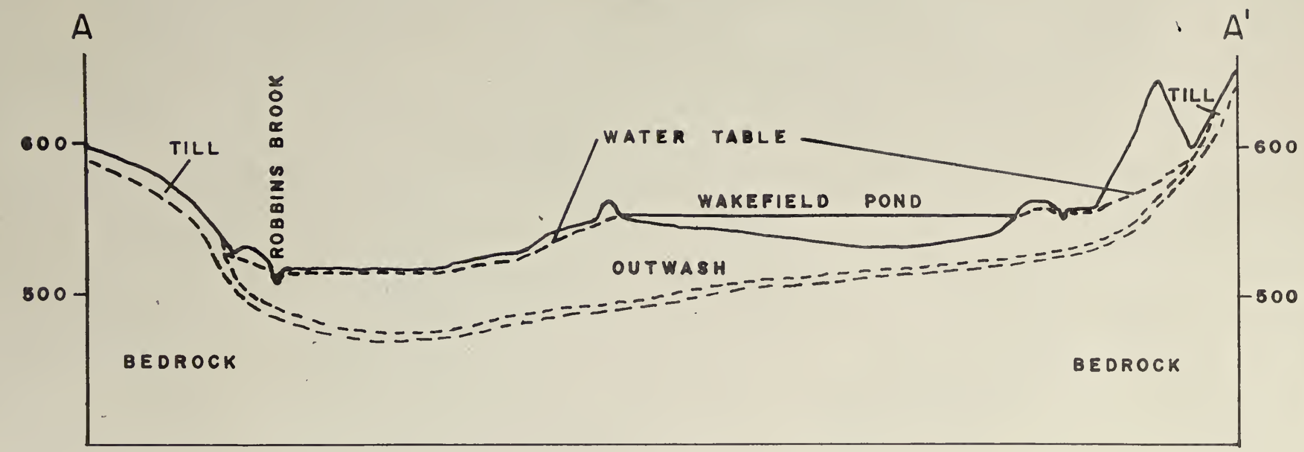
SHOWING LOCATION OF SELECTED WELLS, CONTOURS ON BEDROCK SURFACE, AND OUTWASH DEPOSITS, 1961

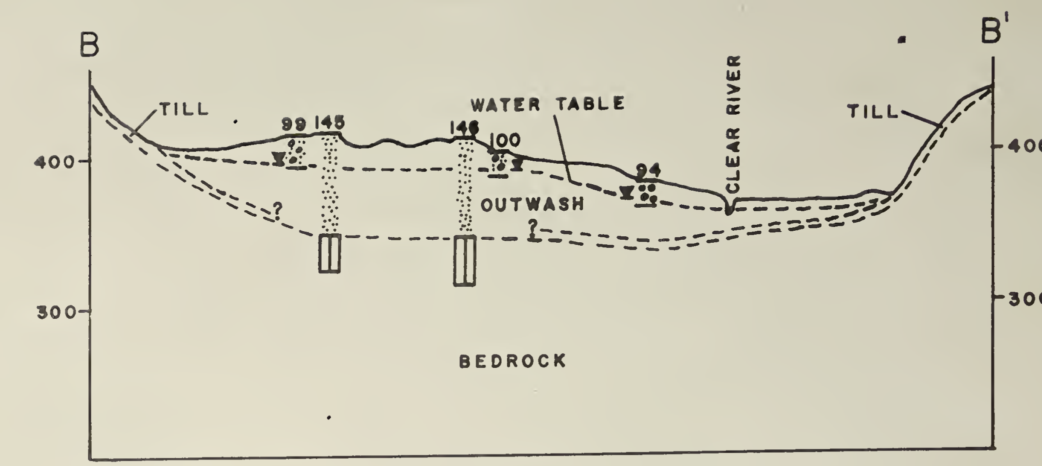
PLATE 2

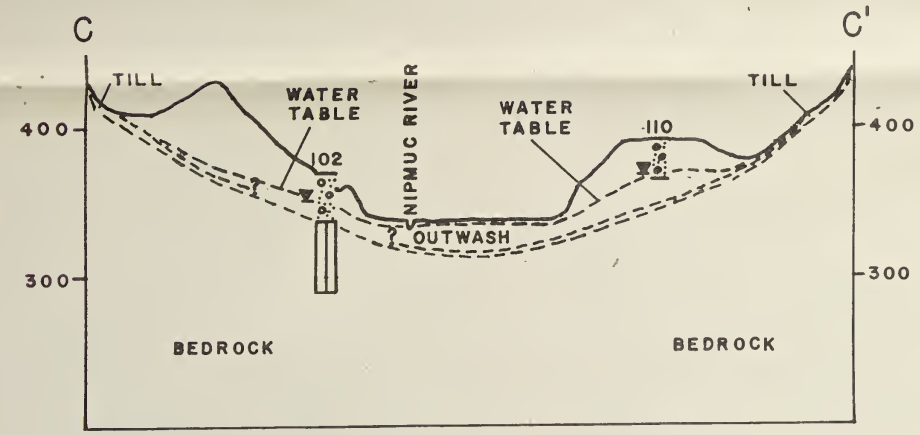


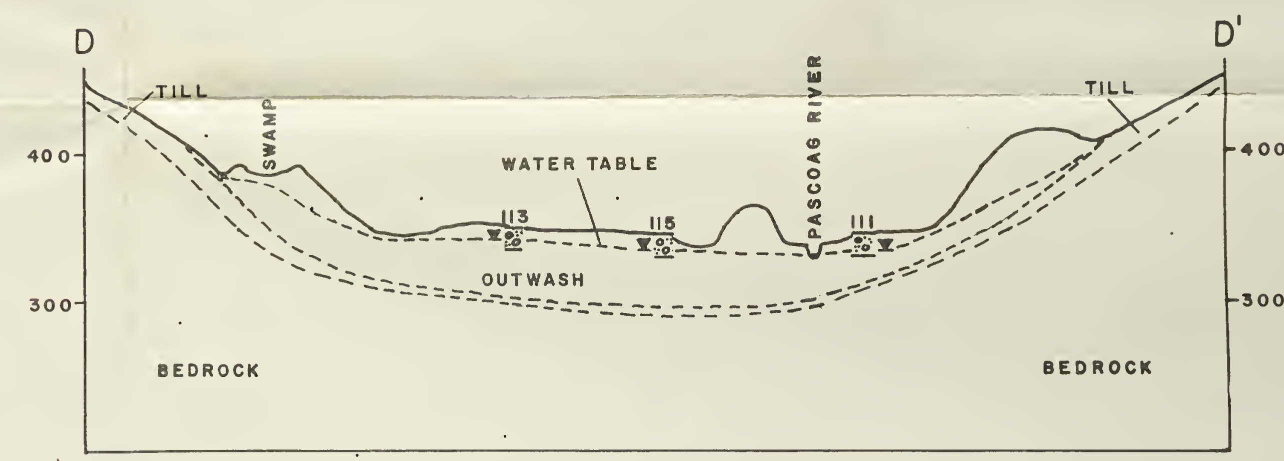
B
B'
TILL
99 145
148
100
WATER TABLE
94
CLEAR RIVER
TILL
400
300
OUTWASH
?
BEDROCK

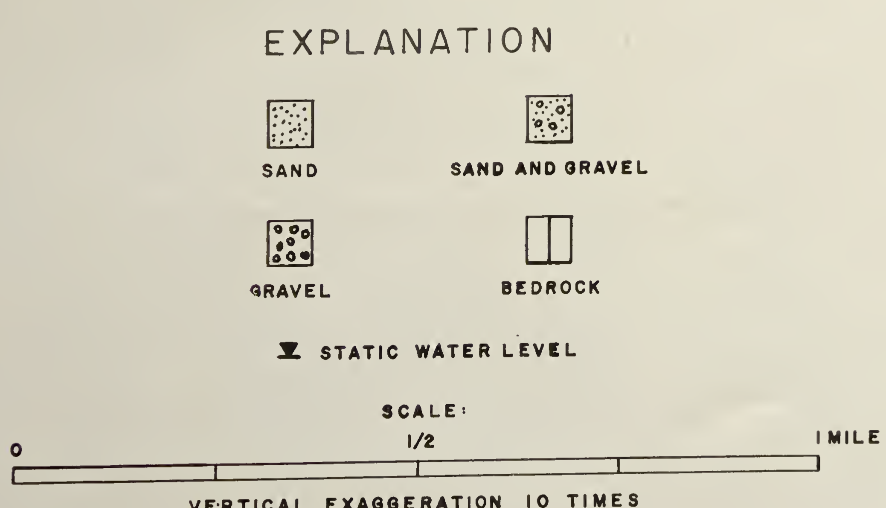
D'







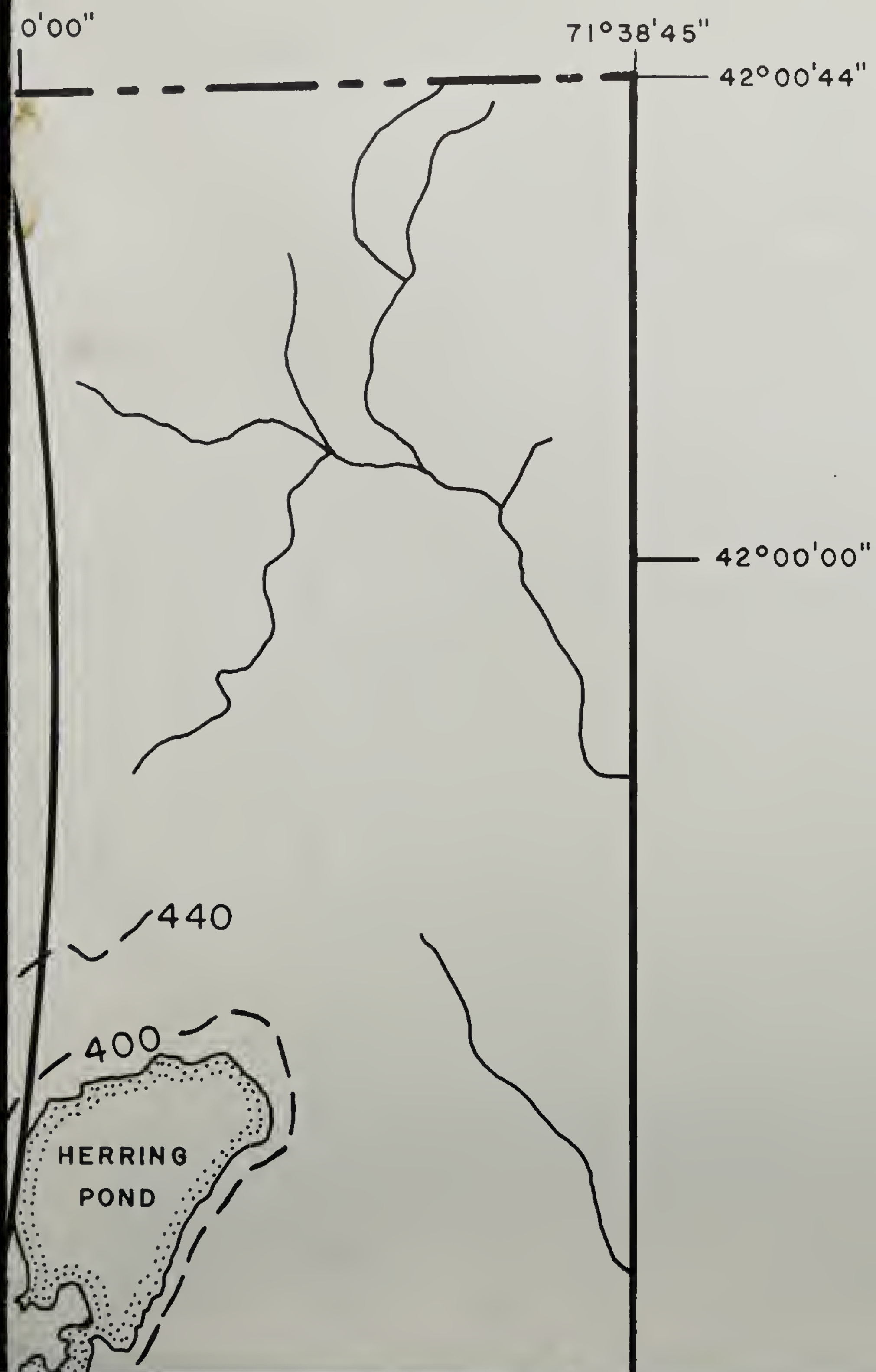




Geologic sections showing approximate position of bedrock surface and lithology of unconsolidated deposits in the vicinity of Wallum Lake

(For location of sections see plate 1)

PLATE 3



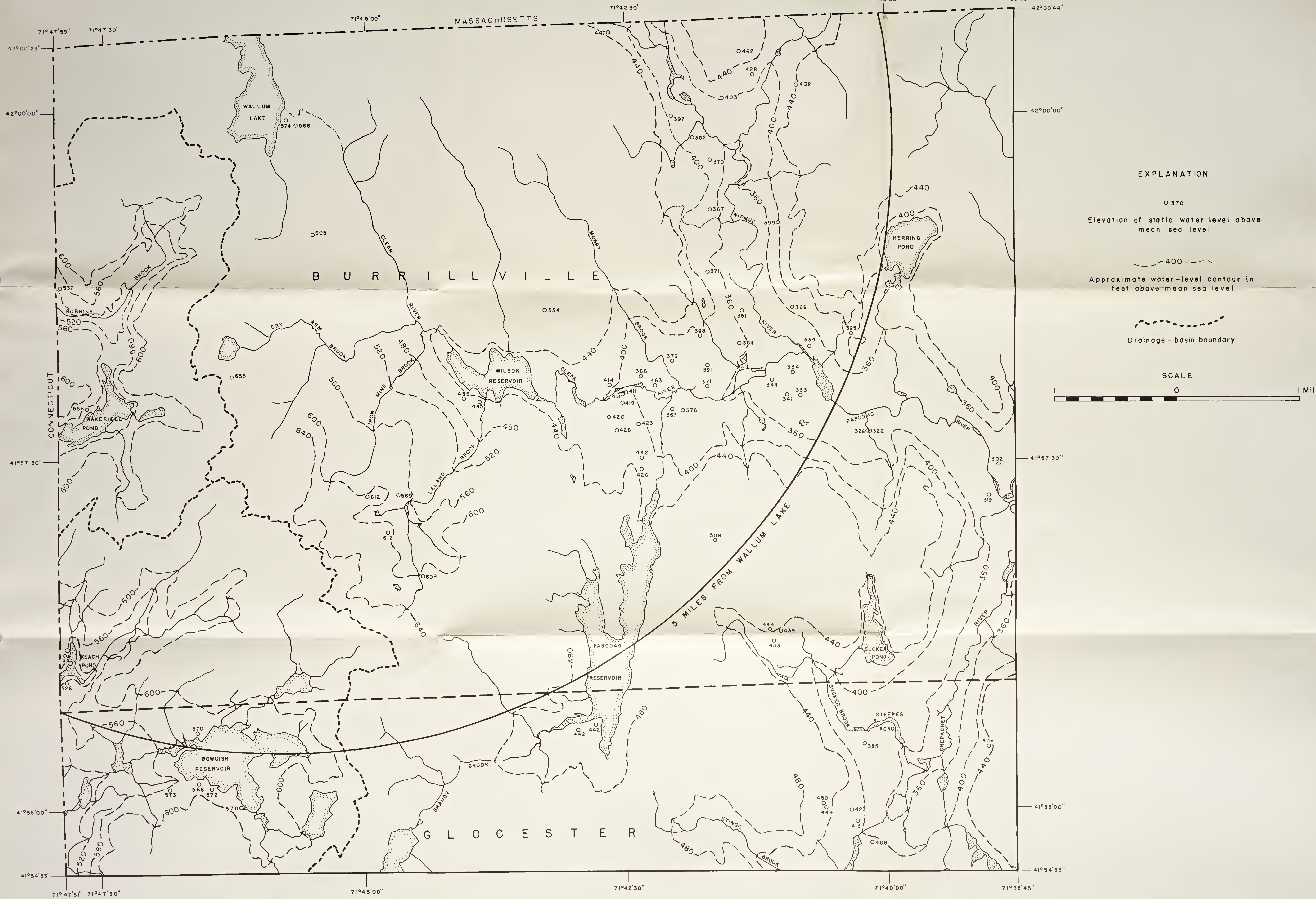
EXPLANATION

o 370

Elevation of static water level above mean sea level

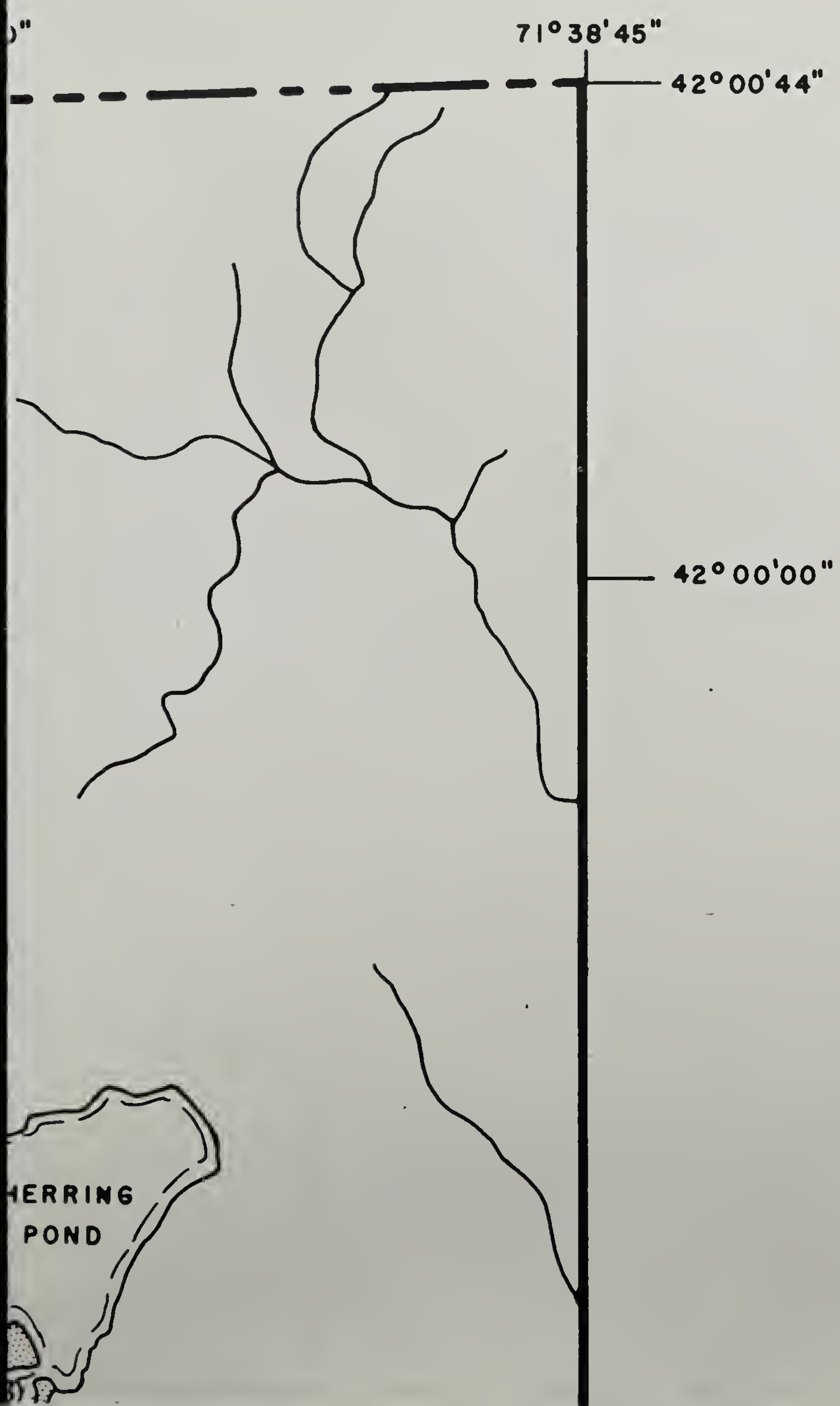
400

Approximate water-level contour in



Map showing generalized water-table contours in the vicinity of Wallum Lake, based on measurements of water levels October–November, 1960

PLATE 4



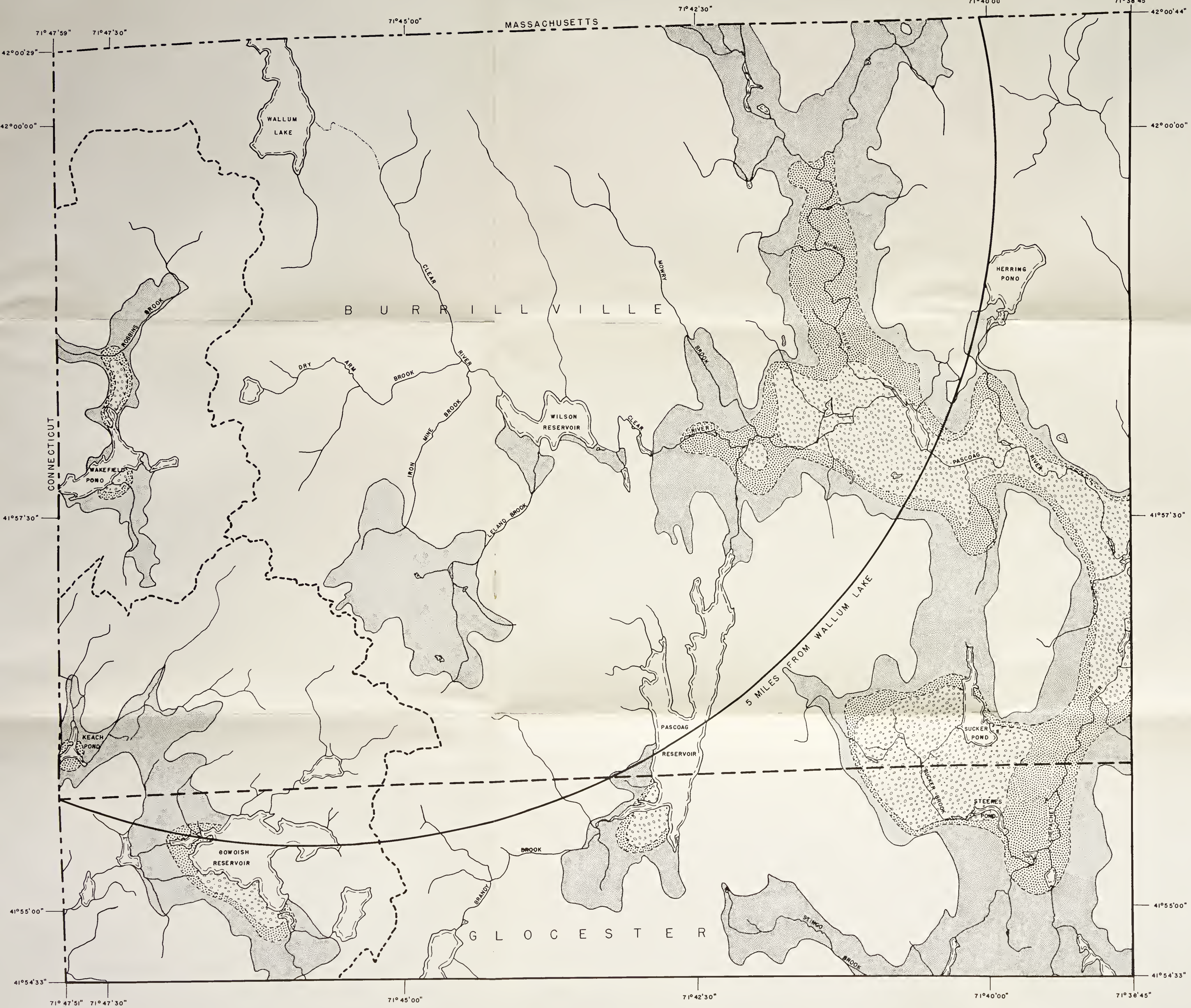
EXPLANATION

Area 1

Many properly constructed drilled wells in this area will produce 150 gpm or more from outwash deposits 25 to 80 feet in saturated thickness, unless fine-grained materials are encountered. Maximum reported yield is 350 gpm (Bur. 9 and 149). Deposits are traversed by major streams and large sustained yields may be obtained from wells situated so as to induce recharge from these streams. Water is generally soft and may contain iron or manganese.

Area 2

Most drilled, dug, and driven wells in this area will produce 20 to



EXPLANATION

Area 1

Many properly constructed drilled wells in this area will produce 150 gpm or more from outwash deposits 25 to 80 feet in saturated thickness, unless fine-grained materials are encountered. Maximum reported yield is 350 gpm (Bur. 9 and 149). Deposits are traversed by major streams and large sustained yields may be obtained from wells situated so as to induce recharge from these streams. Water is generally soft and may contain iron or manganese.

Area 2

Most drilled, dug, and driven wells in this area will produce 20 to 150 gpm from outwash deposits generally 10 to 25 feet in saturated thickness, unless fine-grained materials or bedrock are encountered. Where wells can be situated so as to induce recharge from streams and ponds it may be possible to obtain more than 150 gpm. Water is generally soft and may contain iron or manganese.

Area 3

Most drilled, dug, and driven wells in this area will produce 10 to 20 gpm from outwash deposits generally less than 10 feet in saturated thickness. Some wells may produce more than 20 gpm from deposits adjacent to streams and ponds; some wells may go dry seasonally. Water is generally soft and may contain iron or manganese.

Area 4

Most drilled and dug wells in this area will produce less than 10 gpm from bedrock and till. Wells in bedrock generally are more dependable than wells in till, which may fail during times of drought. Water may be hard and may contain iron.

Drainage-basin boundary

SCALE

1 0 1 Mile

Map showing estimated availability of ground water in the vicinity of Wallum Lake

REPORTS AND MAPS DEALING WITH GROUND-WATER CONDITIONS IN RHODE ISLAND PUBLISHED BY THE STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS IN COOPERATION WITH THE U. S. GEOLOGICAL SURVEY

GEOLOGICAL BULLETINS:

*No. 1. Progress Report on the Ground-Water Resources of Providence, R. I.; C. M. Roberts and M. L. Brashears, Jr, 1945.

*No. 2. Well and Test Hole Records for Providence, R. I.; C. M. Roberts and H. N. Halberg, 1945.

*No. 3. Geology and Ground-Water Resources of the Pawtucket Quadrangle, R. I.; A. W. Quinn and others, 1948.

*No. 4. Geology and Ground-Water Resources of the Georgiaville Quadrangle, R. I.; G. M. Richmond and W. B. Allen, 1951.

*No. 5. Geology and Ground-Water Resources of Woonsocket, R. I.; A. W. Quinn and W. B. Allen, 1950.

*No. 6. Ground-Water Resources of Rhode Island; W. B. Allen, 1953.

No. 7. Ground-Water Resources of the Bristol Quadrangle, R. I.-Mass.; W. H. Bierschenk, 1954.

No. 8. Ground-Water Resources of the East Greenwich Quadrangle, R. I.; W. B. Allen, 1956.

No. 9. Ground-Water Resources of the Kingston Quadrangle, R. I.; W. H. Bierschenk, 1956.

No. 10. Ground-Water Resources of the Providence Quadrangle, R. I.; W. H. Bierschenk, 1959.

No. 11. Appraisal of the Ground-Water Reservoir Areas in Rhode Island; S. M. Lang, 1961.

HYDROLOGIC BULLETINS:

No. 1. Ground-Water Levels in Rhode Island, 1956; W. B. Allen and S. M. Lang, 1957.

No. 2. Ground-Water Levels in Rhode Island, 1957; G. W. Hahn and J. A. Wosinski, 1960.

No. 3. Hydraulic Characteristics of Glacial Outwash in Rhode Island; S. M. Lang, W. H. Bierschenk, and W. B. Allen, 1960.

No. 4. Ground-Water Levels in Rhode Island, 1958-1959; K. E. Johnson, 1961.

SCIENTIFIC CONTRIBUTIONS:

*No. 1. Ground-Water Conditions in the Vicinity of Mash [illegible]; R. M. Jeffords and W. B. All[illegible]

*No. 2. Ground-Water Resources in the Vicinity of Exeter [illegible] effords, 1948.

*No. 3. Ground-Water Resources of Bristol, Warren, and Barrington, Bristol County, R. I.; W. B. Allen and J. A. Blackhall, 1950.

*No. 4. Geologic Factors Affecting the Yield of Rock Wells in Southern New England; R. V. Cushman, W. B. Allen, and H. L. Pree, 1953.

GROUND-WATER MAPS:

GWM 1. Ground-Water Map of the Wickford Quadrangle, R. I.; K. E. Johnson and L. Y. Marks, 1959.

GWM 2. Ground-Water Map of the Slocum Quadrangle, R. I.; G. W. Hahn, 1959.

GWM 3. Ground-Water Map of the Crompton Quadrangle, R. I.; W. B. Allen, K. E. Johnson, and R. A. Mason, 1959.

GWM 4. Ground-Water Map of the East Providence Quadrangle, Mass.-R. I.; W. B. Allen and L. A. Gorman, 1959.

GWM 5. Ground-Water Map of the Narragansett Pier Quadrangle, R. I.; G. W. Hahn, 1959.

GWM 6. Ground-Water Map of the Hope Valley Quadrangle, R. I.; W. H. Bierschenk and G. W. Hahn, 1959.

GWM 7. Ground-Water Map of the Fall River Quadrangle, Mass.-R. I.; W. B. Allen and D. J. Ryan, 1960.

GWM 8. Ground-Water Map of the Coventry Center Quadrangle, R. I.; R. A. Mason and G. W. Hahn, 1960.

GWM 9. Ground-Water Map of the Carolina Quadrangle, R. I.; A. M. LaSala, Jr., and G. W. Hahn, 1960.

GWM 10. Ground-Water Map of the Oneco Quadrangle, Conn.-R. I.; K. E. Johnson, R. A. Mason, and F. A. DeLuca, 1960.

GWM 11. Ground-Water Map of the Quonochontaug Quadrangle, R. I.; A. M. LaSala, Jr., and K. E. Johnson, 1960.

GWM 12. Ground-Water Map of the North Scituate Quadrangle, R. I.; S. J. Pollock, 1960.

GWM 13. Ground-Water Map of the Voluntown Quadrangle, Conn.-R. I.; A. D. Randall, W. H. Bierschenk, and G. W. Hahn, 1960.

An asterisk (*) indicates that the report is out of print, but such reports are available for consultation in certain libraries.